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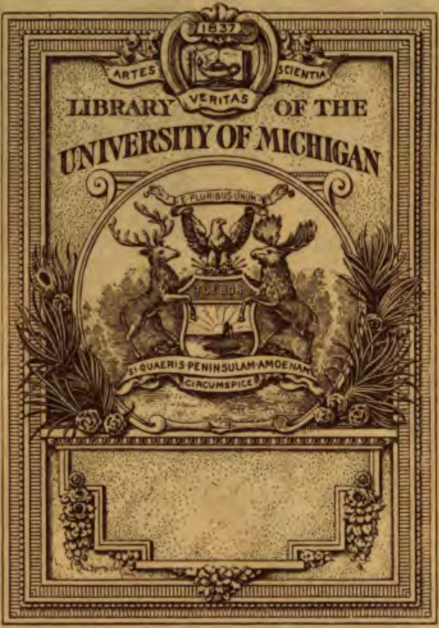

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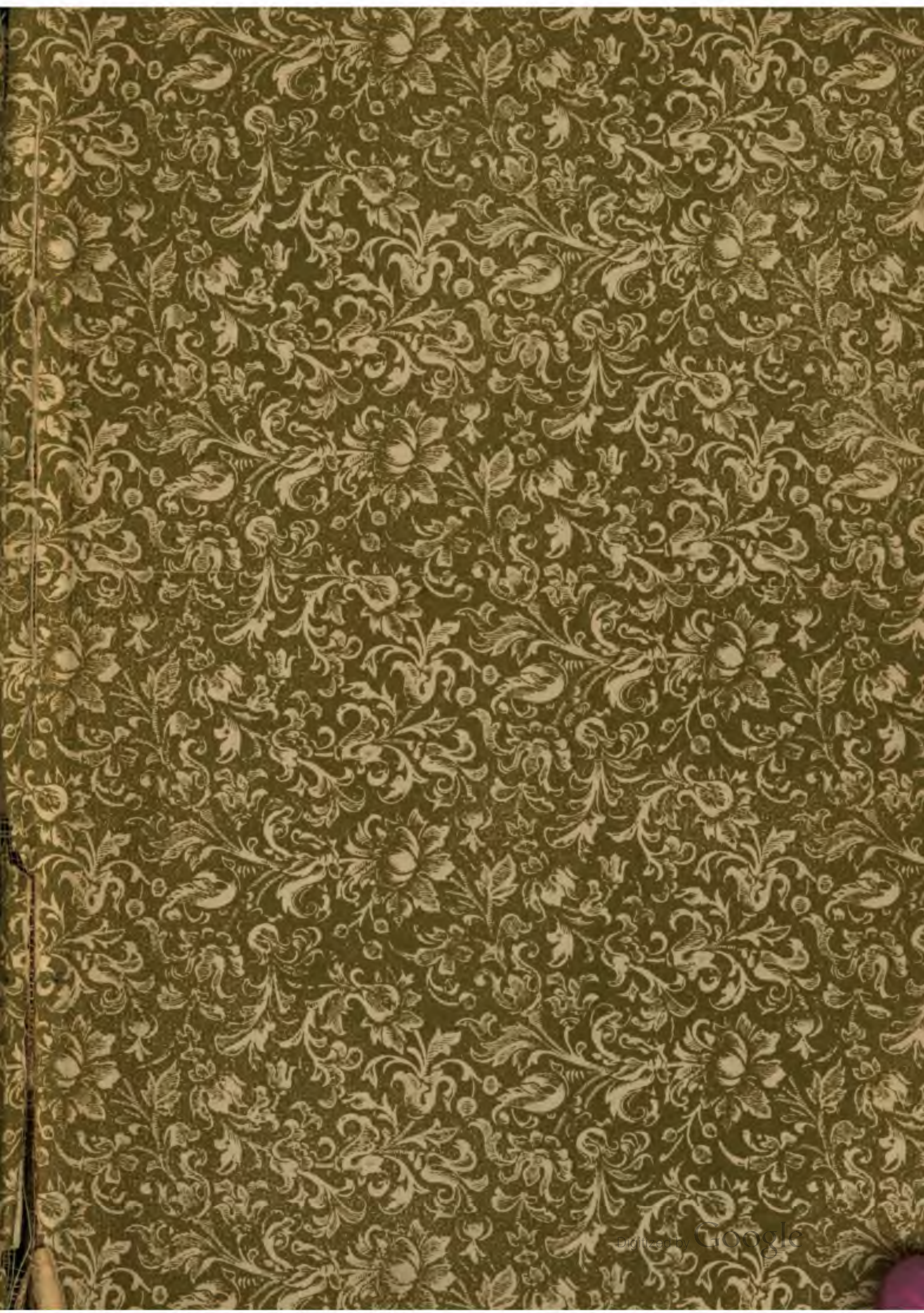

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CAPTAIN GEORGE TRIMBLE
LICENSED PILOT FOR THE GREAT LAKES

THE LAKE PILOTS' HANDBOOK

◆

USEFUL KNOWLEDGE PERTAINING TO THE
GREAT LAKES, AND GREAT LAKES' PILOTING,
THAT SHOULD BE USEFUL TO THE PROFESSIONAL
AS WELL AS TO THE BEGINNER.

◆

COMPILED BY
CAPT. GEORGE TRIMBLE.

RIVERSIDE PRINTING CO., PT. HURON,
1907

PREFACE

The need of a handy book of reference and of general information on the subject of the Great Lakes and Great Lakes' Piloting has led the author to undertake the preparation of this work. For years he has been an enthusiastic collector of marine books and papers until his library contains almost every publication that treats of either lake or ocean affairs. From these books and papers have been culled all the valuable information that should be of interest to lake sailors, and this information is presented to you in these pages, together with much valuable information that the author has gained by years of service on the Great Lakes. The author has consulted such authorities as: Blue Book of American Shipping, Beers' History of the Great Lakes, Beeson's Inland Marine Guide, Patterson's Nautical Encyclopedia, Scott's Coast Pilot, American Merchant Marine, Henderson's Elements of Navigation, Georgian Bay Coast Pilot, Knight's Modern Seamanship, The Marine Review, &c., &c., and desires to express his indebtedness to all of these, especially the publications from the office of The Marine Review.

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WHERE I GOT MY INFORMATION

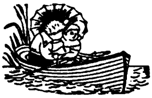
I have a library containing almost every book that has ever been published on the subject of the lake marine, from the old Barnett's Coast Pilot to the handsome bulletin published at the office of the U. S. Lake Survey; I have the Lake Survey charts, the Hydrographic charts, and the Canadian make of charts; but one of my most valuable sources of information is a scrap book filled with clippings from the "marine news" columns of the daily papers, or the marine weeklies. I have made it a point never to miss a number of the daily paper that prints marine news.

A PILOT

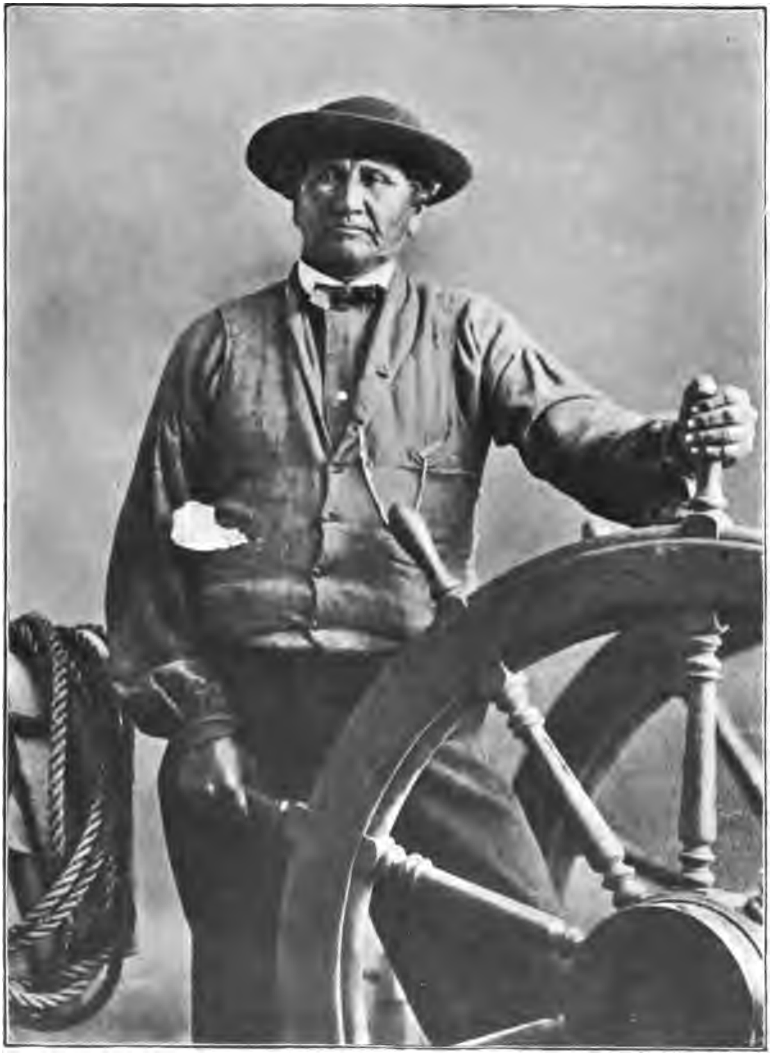
A Definition.

A pilot is a person who makes a business of conducting vessels in and out of port, through narrow channels, up rivers, or along coasts where the navigation is especially difficult or dangerous.

The business of an ocean pilot is very much different from that of a lake pilot. Ocean steamers do not generally carry pilots as a part of their permanent crew. Lake steamers are required by law to carry two or three pilots aboard as part of their crew. The master and mates of an ocean steamer must be proficient navigators and be able to take their ship from one part of the world to another, but when they approach a port a pilot comes out in a small boat and takes charge of the vessel and conducts her into the harbor. But on the Great Lakes every master and mate of a steamer must also be a licensed pilot and be able to pilot his ship through all the difficult channels and along the five thousand miles of dangerous coasts, and besides being able to take the ship safely into one port, as the ocean pilots do, he is expected to be able to take his ship into the scores of harbors that abound on the Great Lakes. A Commander of an American ocean warship, who is now doing service on the Government ships on the lakes, is quoted as saying that he considers the lake pilots the best pilots in the world. He says that in a single trip through the narrow channels of the St. Clair and Detroit rivers, you would meet more ships than you would meet in a trip from New York to the East Indies, and the greater part of these ships would be the mammoth steel freighters that, from a distance, appear too big and unwieldy to be handled at all. And these big ships are taken through these narrow channels at night just as safely as they are in the daytime. In the trip from Lake Erie to Lake Superior a pilot has to take his ship through the Detroit, St. Clair and Soo rivers, the aggregate distance of these rivers being over 150 miles. And when the lake is reached the same vigilance is needed as is required in the rivers. With 2500 vessels doing business on the Great Lakes there will, of course, be many in sight all the time. Collisions have to be avoided, not only with boats, but with floating wrecks, rafts, and with sunken rocks, and shoals, etc., etc. Is it any wonder then that the business of a lake pilot is an important one. Every year the Government of the United States is drawing the lines tighter around the lake pilot. A government inspector was asked as to what he thought was required of Great Lakes' pilots. He answered, "When a pilot can take a ship safely through the rivers, without a stake or a buoy or a guide of any kind, excepting his knowledge of landmarks, etc., I will then pronounce him proficient." If pilots could not do this, many ships would meet disaster on account of misplaced buoys, unlighted ranges, etc. A pilot on an American steamer must be an American citizen, must be able to read and write, and must hear and see perfectly.



THE GREAT LAKES



THE FAMOUS OLD INDIAN PILOT OF THE ST. LAWRENCE RIVER

Historical Facts Regarding the Great Lakes

The St. Lawrence river was discovered by the explorer Aubert in 1508. The French explorer Jacques Cartier ascended the St. Lawrence river as far as the Indian village of Hochelaga (now Montreal) in 1534.

Lake Huron was the first of the Great Lakes to be discovered. In 1615 the French explorers Le Caron and Champlain both discovered Lake Huron but in separate parties. Both explorers came up the St. Lawrence as far as Montreal and then up the Ottawa river. They then took different routes across the country to Georgian Bay and into Lake Huron. The exploring parties met in the Lake Huron region and joined forces. Lake Ontario was discovered the same year on the return trip.

Lake Erie was the last of the lakes to be discovered. Joliet discovered Lake Erie in 1669.

Lake Superior was discovered in 1629 by the French explorer Brule.

Lake Michigan was discovered in 1634 by the French explorer Nicolet.

The first recorded passage of the Detroit river by white man was in 1670 by two French priests.

The first white man to see the Niagara Falls is supposed to have been the explorer Brule.

The French explorer La Salle built the first vessel on the Great Lakes in 1679. This little vessel—the Griffon—is described on another page.

The first American vessel to be built on the Great Lakes was the "Washington," built at Erie (then Presque Isle) in 1797.

In 1812 a vessel called the "Fur Trader" was built on Lake Superior and after being used in the fur business for awhile she was run over the rapids at the Soo in the attempt to get her to the lower lakes. But she was almost completely wrecked in the attempt. Another little vessel, the Mink, was run over the rapids in 1817 and sustained but little damage.

A 96 ton brig was built for service on Lake Erie in 1814, but was soon laid up as being too big to successfully do business on the lakes.

The first steamer built on the Great Lakes was the "Ontario" built at Sacketts Harbor in 1816. She was a vessel of 232 tons. The Canadian steamer "Frontenac" was built during the same year. But the first steamer built on Lake Erie, for up-lake service, was the "Walk-in-the-Water," built at Buffalo in 1818. This steamer is described on another page.

In 1826 the first steamer sailed on Lake Michigan.

Regular passenger service was established to Chicago in 1830.

In 1836 the first shipment came into Buffalo when the brig "John Kenzie" brought in 3,000 bushels of wheat.

The first steamers from Buffalo ventured only as far as Detroit.

The first locomotive used in Chicago was carried there in a sail vessel in 1837.

The first grain elevator was built at Buffalo in 1842.

The first steamer to use propellers instead of paddle wheels was the "Vandalia" built at Oswego in 1841.

The first steamer on Lake Superior was the "Independence" in 1845. The Independence came from Chicago and was portaged around the Soo rapids.

THE FIRST SHIP ON THE GREAT LAKES.

The first known ship to navigate the Great Lakes was the "Griffon," a little vessel of about sixty tons, built in 1679 by the French explorer, La Salle. This ship was launched into the Niagara River about the present site of the village of La Salle. On August 7th, 1679, the Griffon, loaded with supplies for a long trip of exploration, sailed up the lakes. Very little is recorded of the trip but the supposition is that the north shore of Lake Erie was followed until the entrance to the Detroit river was found, and on Lake Huron the west shore was followed to the Straits of Mackinac. Early in September the little ship had reached Green Bay. Here La Salle loaded her with furs that he purchased from the Indians, and ordered his captain to take her back to Lake Erie. La Salle did not accompany the ship but with part of his men he started overland on his trip of exploration. The Griffon was never heard from afterward, no doubt having foundered in a gale with her entire crew.

THE FIRST STEAMER ON THE GREAT LAKES.

The steamer "Walk-in-the-Water," built in Buffalo in 1818, is generally spoken of as the first steamer to sail the Great Lakes, but, as a matter of fact, two steamers were built on Lake Ontario in 1616. These were the Canadian steamer Frontenac and the American steamer Ontario. But these boats were not looked upon as the first Great Lakes' steamers because their operations were confined to Lake Ontario. The "Walk-in-the-Water" measured 338 tons. The owners of this great steamboat thought none of the lake men would be capable of handling her and brought a master from the North river. This master promptly resigned his position after encountering one of Lake Erie's vicious sou'westers. A lake sailor was then placed in command. The "Walk-in-the-Water" was driven ashore in a gale on Lake Erie in 1821. Her engines were saved and placed into the steamer Superior in 1822.

THE GREAT LAKES.

Total area of water surface—over 90,000 square miles.

Over 5,000 miles of coast.

Combined area of Great Lakes exceeds the area of England, Wales and Scotland.

Lighted 200 American lighthouses.

Lighted 100 Canadian lighthouses.

Lighted 100 pairs of American ranges.

Lighted 30 pairs of Canadian ranges.

Lighted 65 American gas buoys.

Lighted 8 Canadian gas buoys.

Lighted 12 American light ships.

Lighted scores of float lights and beacons.

The United States lighthouse board place in position at the opening of navigation each spring 600 spar buoys and 60 can buoys and nun buoys.

There are 85 American fog signal stations on the lakes.

There are 18 Canadian fog signal stations of the lakes.

The United States Weather Bureau display storm signals at 96 places on the Great Lakes.

The Canadians display storm signals at 31 places.

There are 60 American life saving stations.

There are 9 Canadian life saving stations.

Total length of the Great Lakes system—from the mouth of the St. Lawrence river to Duluth—2,384 miles.

From the east end of Lake Ontario to the west end of Lake Superior—1,150 miles.

From the east end of Lake Ontario to Chicago—1,050 miles.

Quebec to Duluth—1,560 miles; Quebec to Chicago—1,465 miles; Montreal to Duluth—1,400 miles; Montreal to Chicago—1,305 miles; Buffalo to Duluth—980 miles; Buffalo to Chicago—890 miles.

LAKE SUPERIOR.

Largest expanse of fresh water in the world. The water of Lake Superior is chemically pure. Area 31,800 square miles; 1,500 miles of coast. Greatest length, 350 miles; greatest breadth, 160 miles; greatest depth, 1,008 feet; 600 feet above the sea; about 21 feet above Lake Huron. Lighted by 55 lighthouses; has 22 fog signal stations. Has 8 life saving stations; 22 storm signal stations.

LAKE HURON.

Area 23,200 square miles; 800 miles of coast; greatest length, 220 miles; greatest breadth, 100 miles; greatest depth, 750 feet; 580 feet above the sea; 9 feet above Lake Erie; lighted by 35 lighthouses; has 21 fog signal stations; 11 life saving stations; 32 storm signal stations.

LAKE MICHIGAN.

Area 22,400 square miles; 1,200 miles of coast; greatest length, 310 miles; greatest breadth, 118 miles; greatest depth, 870 feet; 580 above the sea; 326 feet above Lake Ontario; lighted by 45 lighthouses; has 35 fog signal stations; 32 life saving stations; 30 storm signal stations.

LAKE ERIE.

Area 9,932 square miles; 650 miles of coast; greatest length, 240 miles; greatest breadth, 57 miles; greatest depth, 210 feet; 572 feet above the sea; 326 feet above Lake Ontario; lighted by 45 lighthouses; has 12 fog signal stations; 9 life saving stations; 21 storm signal stations.

LAKE ONTARIO.

Smallest of the five great lakes; area, 7,240 square miles; nearly 500 miles of coast; greatest length, 190 miles; greatest breadth, 55 miles; greatest depth, 738 feet; 246 feet above the sea; lighted by 30 lighthouses; has 8 fog signal stations; 9 life saving stations; 20 storm signal stations.

LAKE ST. CLAIR.

Area, 396 square miles; 100 miles of coast; greatest length, 27 miles; greatest breadth, 25 miles; depth, 24 feet; 576 feet above the sea; 3 feet above Lake Erie; 6 feet below Lake Huron. Previous to 1858 the channel entering Lake St. Clair was only 9½ feet deep. By 1871 it had been deepened to 13 feet, and by 1874 there was a channel 16 feet deep. It remained at this depth until 1887 when the work of deepening began again and it was completed to a depth of 21 feet.

ST. MARY'S RIVER.

Length, from Point Detour to Point Iroquois, 65 miles; length, from Point Detour to canal, 50 miles; length, from canal to Point Iroquois, 15 miles. With the present prevailing stage of water the least depth is 19 feet. By the old Lake George route the distance from Point Detour to Point Iroquois is 75 miles, and the depth, 15 feet. The present Hay lake channel was opened in 1894 and shortened the route from Detour to the Soo, 10 miles. Another new route is being excavated and will be opened in 1908. This route leads to the westward of Neebish island and the plan is to use this channel for down bound boats and the present channel for unbound boats. Both channels will be the same from the canal down to Hay lake. They then branch off, one going on each side of Neebish island, and coming together again in Mud lake. The new west channel will not shorten the route from Detour to the Soo. The St. Joseph channel branches off from the Hay lake channel at the foot of Sugar island, just below the dike. This channel leads into the North channel.

The navigation of the St. Mary's river is governed by a strict set of rules and regulations which appear in another part of this book.

The St. Mary's falls have a drop of 20 feet and are overcome by the locks at the canal. These rapids are about a half mile wide and three-fourths of a mile long.

THE ST. CLAIR RIVER.

Length, Fort Gratiot to ship canal, 40 miles. The current in the rapids at Fort Gratiot is five miles an hour. The current entering the canal is about 1½ miles an hour; abreast of Port Huron, St. Clair and Marine City the current averages about 2 miles an hour.

DETROIT RIVER.

Length, Lake St. Clair to Lake Erie, 28 miles. The current at the Limekiln Crossing averages about 2½ miles an hour while for the balance of the river the average current is about 1½ miles an hour.

NIAGARA RIVER.

Length, Lake Erie to Lake Ontario, 33 miles. Current at Buffalo, 4 to 7 miles an hour; current in whirlpool rapids, 30 miles an hour. The lower portion of the river, from Lake Ontario to Lewiston (7 miles) is from 30 to 70 feet deep. 280,000 cubic feet of water enters Niagara river from Lake Erie, every second. The fall in Niagara river from Lake Erie to Lake Ontario, is 326 feet.

ST. LAWRENCE RIVER.

Length, from Lake Ontario to the Straits of Belle Isle, nearly 1,200 miles. There are many dangerous rapids in the St. Lawrence, all overcome by Canadian canals. From Lake Ontario to Quebec the drop is 249 feet. A boat passing through the St. Lawrence river, from Lake Ontario to the sea, would go through six canals with a total length of 45 miles. There are 21 locks in these six canals and the total lift is 207½ feet. These canals are all between Lake Ontario and Montreal. From Montreal eastward to the Gulf of St. Lawrence, there is a channel for deep draft ocean going vessels. From Lake Ontario to Montreal the draft of water is limited to 14 feet. Tidewater is reached about midway between Montreal and Quebec. Spring tide rises 18½ feet at Quebec. Salt water becomes noticeable about 30 miles below Quebec.

NIAGARA FALLS.

Height of American falls, 167 feet; height of Horseshoe falls, 158 feet; contour line of American falls, 1,060 feet; contour line of Horseshoe falls, 3,010 feet; average depth of river between the falls and rapids, 180 feet. The Horseshoe falls wears back about 4½ feet each year, in the center of the channel, and about 2 feet each year on the sides. The recession of the American falls is very slight. 15,000,000 cubic feet of water passes over both falls per minute.

CANALS

* * *

THE SOO CANALS.

The first canal was built on the Canadian side of the river by the North West Fur Company in 1798. The lock was 38 feet long, 8 feet 9 inches wide, with a lift of 9 feet. A tow path was made along the shore for oxen to pull the canoes and small boats through the upper part of the rapids. This lock was destroyed in 1814 by United States troops from Mackinac Island.

The first ship canal, known as the state canal, was built on the American side of the river in 1855. There were two tandem locks each with a lift of 9 feet. These locks were 350 feet long, 70 feet wide, with a depth of 11½ feet. These locks were destroyed by excavations for the present Poe lock.

The Weitzel lock—the present old lock—was built in 1881, by the United States. The length of this lock is 515 feet, width 60 feet at the gates and 80 feet inside, and average depth 14 feet 10 inches. The Poe lock was built in 1896. This lock is 800 feet long, 100 feet wide, and an average depth of 20 feet.

The Canadian lock is 900 feet long, 60 feet wide, 22 feet deep, and was built in 1895.

Hydraulic power is used for operating the American locks, and electricity, generated by water power, is used for operating the Canadian locks.

Before the State canal was opened in 1855, cargoes were unloaded at the Soo, below the rapids, then taken across the portage, one mile long, and reloaded aboard boats. In 1851 the total shipment of freight over this tramway portage was 12,600 tons.

The first year the canal was opened at the Soo, 1855, 14,500 tons of freight passed through. Ten years later, 1865, this had increased to 180,000 tons, in 1875, to 833,000 tons, in 1885 to 3,250,000 tons, in 1895 to 15,000,000 tons, and in 1905 to almost 45,000,000 tons.

Previous to 1881 the canal at the American Soo was under the control of the State of Michigan and tolls were charged to cover operating expenses, the first rate being 6½ cents per registered ton, which was gradually reduced to 2½ cents.

The United States employ about 95 men in the operating of the canals at the Soo.

THE WELLAND CANAL.

The Welland canal connects Lake Erie and Lake Ontario and overcomes the rapids of the Niagara river and Niagara falls. The length of this canal is 26¾ miles. The total lift is 326¾ feet and there are 25 locks, each 270 feet long and 45 feet wide, with 14 feet of water on the sills. Besides the regular lift locks there are two pairs of guard gates and one guard lock. Tolls are collected. Vessels must not run more than 4 miles an hour through the canal reaches. The first Welland canal had 39 locks and was not cut through to Lake Erie. This canal led into the Welland river; from there vessels passed into the Niagara river just below Grand Island and then came up the Niagara river to Lake Erie. The present Welland canal is the third one built. The Lake Ontario entrance is at Port Dalhousie and the Lake Erie entrance is at Port Colborne. The second canal built came into Lake Erie at Port Maitland. This old canal is still there but is used as a feeder for the present canal. It connects with the present new canal at the town of Welland. It has locks 150 feet long, 26½ feet wide and 6 feet deep.

THE ERIE CANAL.

The Erie canal is a free waterway, having a capacity for boats 98 feet long, 17 feet 10 inches beam, and 6 feet draft. Most of the freighting on this canal is done by canal boats, towed by horses and mules. The length of this canal is 363 miles and the general width is 70 feet. Connects Buffalo with Albany. There are 72 locks and the total lift is 568 feet. The work of construction began in 1817 and the canal was opened in 1825. The original cost was $7,602,000 but improvements have brought the cost to date up to $52,000,000.

CHICAGO DRAINAGE CANAL.

Length, 28 miles; from 160 to 290 feet wide; 22 feet deep. Connects Chicago with the Des Plaines river. Current figured at from 1¼ to 2 miles an hour. After January 17th, 1907, the bridges crossing this canal must go into service as movable bridges and the canal will then be a free waterway. The main object in building this canal was to carry off the foul water of the Chicago river.

ST. CLAIR FLATS CANAL.

Built in 1871. Extends across the St. Clair flats and into Lake St. Clair; consists of two dikes, each 7,200 feet long and with a channel between them 292 feet wide and twenty feet deep. There is also a new channel just completed (1906) on the west side of the west dike, the west dike therefore now being the dividing pier between the two channels. Upbound boats must take the east side, and downbound boats must take the west side. Without these piers a channel could not be kept open on account of drifting sand.

THE ST. LAWRENCE RIVER CANALS.

A boat coming from Montreal to Lake Ontario would have to pass through six canals and make 21 lockages. These locks would give a lift of 207½ feet. The total length of the six canals is 45 miles and the length of the trip from Montreal to Lake Ontario is 182 miles. The first canal—the Lachine—begins right at the city of Montreal and the last canal—the Galops—is 7 miles below Ogdensburg. There is free sailing from Montreal eastward to the sea and westward from Ogdensburg to Lake Erie. The distance from Ogdensburg to Lake Ontario is 62 miles. The distance from Montreal to the mouth of the St. Lawrence river is 986 miles.

The names of the six Canadian canals are as follows, beginning at Montreal: The Lachine, the Soulanges, the Cornwall, Farrans Point, Rapide plat, and Galops. These canals are built to accommodate boats 255 feet long, 42 feet beam and of 14 feet draft. But the new lock at the Farrans Point canal is built to take in a whole tow at one lockage, being 800 feet in length. The Galops lift lock is operated on Sunday; all the other canals are closed. A short description of these canals is given below:

THE LACHINE CANAL.

Length 8½ miles; 5 locks; total lift 45 feet; locks are 270 feet long and 45 feet wide; average depth of canal 14 feet. This canal extends from Montreal to the town of Lachine, and overcomes the St. Louis rapids.

A PILOT'S PERILOUS TASK IN THE LACHINE RAPIDS

THE SOULANGES CANAL.

Length 14 miles; 4 lift locks, 1 guard lock; total lift 84 feet. Locks are 280 feet long and 45 feet wide. This canal overcomes the Cascade rapids, Cedar rapids and Coteau rapids.

THE CORNWALL CANAL.

Length 14 miles; 6 locks; total lift 48 feet. Locks are 270 feet long and 45 feet wide. This canal overcomes the Long Sault rapids, from the town of Cornwall to Dickenson's landing.

FARRANS POINT CANAL.

Length 1 mile; 1 lock; total lift 3½ feet. Lock is 800 feet long and 45 feet wide. The old lock is still in use and is 200 feet long and 45 feet wide, with a depth of 9 feet. This canal overcomes the Farrans point rapids. Descending vessels use the rapids instead of the canal.

RAPIDE PLAT CANAL.

Length 3½ miles; 2 locks; total lift 11½ feet. Locks are 270 feet long and 45 feet wide. This canal extends from Morrisburg to Flaggs bay and overcomes the rapids at that place. Descending vessels run the rapids.

GALOPS CANAL.

Length 7½ miles; 3 locks; total lift 15½ feet. Two locks are 270 feet long and 45 feet wide and one is 800 feet long and 45 feet wide. This canal overcomes the rapids at Point Iroquois, Point Cardinal and the Galops.

CHICAGO TO THE MISSISSIPPI.

Via the Illinois and Michigan Canal and the Illinois River.

Distance from Lake Michigan to the Mississippi river, 325 miles, as follows: 5 miles in the Chicago river, 97 miles in the Illinois and Michigan canal, and 223 miles in the Illinois river.

The Illinois and Michigan canal commences in the South Branch of the Chicago river. There are 15 lift locks and 1 guard lock. The canal was intended to be 60 feet wide at the water surface, 48 feet wide on the bottom, with locks 110 feet long, 18 feet wide and 6 feet deep. The canal is falling into decay. The deepest draft that can now be carried through is about 4½ feet. The longest boat that can now be accommodated in this canal is 100 feet.

GREEN BAY TO THE MISSISSIPPI.

Via the Fox and Wisconsin Rivers.

Distance from Green Bay to the Mississippi, 281 miles. From Green Bay to Portage, on the Wisconsin river, 163 miles. A draft of about 6 feet can be carried. From there to the Mississippi the navigation of the Wisconsin river is very difficult and the available channel is less than 3 feet. But the navigation from Green Bay to Menasha, Oskosh, and to Portage City is good. The total lift is about 200 feet, overcome by 26 locks, suitable for boats 140 feet long, 34 feet beam and over 6 feet draft.

THE OSWEGO CANAL.

This canal has a capacity for boats 98 feet long, 17 feet 10 inches beam, and 6 feet draft. Connect Oswego with Syracuse and leads into the main line of the Erie canal.

DES JARDINS CANAL.

Connects Burlington Bay with Dundas. This canal is fast falling into decay and is used only by small boats. The length is 4 miles, width 50 feet, and original depth was 7 feet, but has now only 4 feet depth. No locks.

MURRAY CANAL, ONT.

Connects the Bay of Quinte with Presque Isle bay. Length 6½ miles. No locks. It is 80 feet wide at bottom, 120 feet at water surface, and 11 feet deep at low stage of water. Tolls are collected.

RIDEAU CANAL, ONT.

Connects the Ottawa river at the city of Ottawa with the eastern end of Lake Ontario at Kingston. Length of navigation waters, 126 miles. Number of locks going from Ottawa to Kingston, 35 ascending, 14 decending, making a total of 49 locks. Going from Ottawa, the lift is 282 feet, then a drop of 164 feet.

Length of locks 134 feet, width 33 feet, depth 5 feet. The depth of the canal is 4½ feet.

THE MIAMA AND ERIE CANAL.

Length 245 miles; extends from Toledo to Cincinnati, enters Swan Creek at Toledo, 1½ miles above its mouth. Toledo to Junction, top width 60 feet, bottom width 46 feet, depth 6 feet. Junction to Dayton, top width 50 feet, bottom width 36 feet, depth 5 feet. Dayton to Cincinnati, top width 40 feet, bottom width 26 feet, depth 4 feet. Total number of locks 105. Locks 90 feet long, 15 feet wide. Total lift from Toledo to Cincinnati 374 feet.

THE OHIO STATE CANAL.

The Ohio canal, which connects with the Cuyahoga river 4¾ miles above the lake, no longer affords an outlet to the Ohio river. It is navigable, however, for boats 90 feet long by 14 wide, drawing 4 feet or less, to Newcastle, Ohio, 97 miles from Cleveland. Originally this canal connected Lake Erie with the Ohio river, with Cleveland at one end and Portsmouth at the other end. The length was 309 miles. There were 144 locks, each with a length of 90 feet and a width of 14 feet and a depth of 4 feet.

ABOUT CANALS.

Vessels of not over eight feet draft, when coming up the Niagara river to Buffalo can overcome the rapids at Buffalo by taking the ship lock at Black Rock. This leads into Black Rock harbor and thence to Buffalo harbor. The lock is 200 feet long and 36 feet wide.

Work is now in progress to enlarge and improve the Erie canal so that it will have a capacity for barges of 1,000 tons, with a draft of 12 feet. The estimated cost of the improvement is $101,000,000. Vessels using this canal will have no spars or high upper works, as the bridges will remain fixed.

LIGHTHOUSES.

There are 200 American lighthouses on the Great Lakes.

There are 100 Canadian lighthouses on the Great Lakes.

There are 100 pairs of American ranges on the Great Lakes.

There are 30 pairs of Canadian ranges on the Great Lakes.

There are 12 American lightships on the Great Lakes.

Besides scores of float lights and beacons.

The highest light on the lakes—Grand Island light, 205 feet.

The highest lighthouse on the lakes—Stannard Rock and Wind Point lights, both 102 feet high.

The oldest lighthouses on the lakes—Marblehead lighthouse, built 1821; Fort Gratiot lighthouse, built 1825.

There are no first order lights on the lakes.

There are six lights of the second order—Spectacle reef, Point Clark, Cove Island, Nottawasaga Island, Stannard Rock, and Grosse Point L. M.

The majority of the lenses in the lighthouses of the lakes are of the fourth order.

There are many records of old time lighthouses, particularly the Boulogne light house in the English Channel. It fell in 1645 after having been in use for 1,450 years.

Modern lighthouse construction dates from the building of the great Eddystone lighthouse in 1759. The present Eddystone lighthouse is 132 feet high and was finished in 1882.

The Bell Rock lighthouse in Scotland is 115 feet high.

The Skerrymore lighthouse in Scotland is 138 feet high.

But two of the greatest undertakings in the line of lighthouse construction are in the United States—Minots Ledge lighthouse in Massachusetts Bay, and Spectacle Reef lighthouse in Lake Huron.

Both of these lighthouses were more difficult to construct than the famous Eddystone lighthouse. The foundation of the Eddystone lighthouse was above water at low tide, while both the Spectacle Reef and Minots Ledge lighthouses had to be built up from below the water line. The original cost of the Spectacle Reef lighthouse was $375,000, while recently $65,000 more was spent in improvements, making a total cost to date of $440,000. Government statistics go to prove that Spectacle Reef is without a doubt one of the most costly lighthouses in the world.

THE STEAMBOAT INSPECTION SERVICE.

The Inspection Service has divided the waters of the United States into ten districts, presided over by Supervising Inspector-General Geo. Uhler. The business of the Great Lakes is handled by the officers of the fifth, eighth, and ninth districts.

The fifth district embraces that portion of Lake Superior bounded by the states of Minnesota and Wisconsin.

The eighth district embraces all the waters of the lakes north of Lake Erie excepting those of the fifth district.

The ninth district embraces the waters of the St. Lawrence river, lakes Erie, Ontario, and Champlain, with the tributary rivers.

Each district is presided over by a Supervising Inspector as follows:

Fifth district—John D. Sloan, Dubuque, Iowa.
Eighth district—C. H. Westcott, Detroit, Mich.
Ninth district—James Stone, Cleveland, Ohio.

LOCAL INSPECTORS OF HULLS AND BOILERS.

Fifth District.

Of Hulls	Of Boilers.	Residences.
John Monaghan	Michael F. Chalk	Duluth, Minn.
Eighth District.		
Frederick J. Meno	John H. Galwey	Detroit, Mich.
Ira B. Mansfield	Roy L. Peck	Chicago, Ill.
George W. Pardee	Chas. C. Eckliff	Grand Haven, Mich.
Charles M. York	Chas. M. Gooding	Marquette, Mich.
Frank W. Van Patten	William A. Collins	Milwaukee, Wis.
Thos. W. Swift, Asst.	Perry N. Knaggs, Asst.	Milwaukee, Wis.
Willis W. Stewart	Frank Van Liew	Port Huron, Mich.
Ninth District.		
Nils B. Nelson	James McGrath	Cleveland, Ohio
Frederick L. R. Pope	Joseph G. Schumacher	Buffalo, N. Y.
James M. Todd, Asst.	William P. Nolan, Asst.	Buffalo, N. Y.
Byron J. Holt	Andrew I. Goodhue	Burlington, Vt.
John R. Molther	Robert Chestnut	Oswego, N. Y.
Chas. A. Potter	Wm. F. Plietz	Toledo, Ohio

Districts.

The Steamboat Inspection districts are numbered fifth, eighth, and ninth.

The Lighthouse districts are numbered ninth, tenth and eleventh.

The Life Saving districts are numbered tenth, eleventh and twelfth.

LIGHTHOUSE SERVICE.

The Ninth district—Lake Michigan and Green Bay.

The Tenth district—American shores of the St. Lawrence River, Lake Ontario, Niagara River, Lake Erie, and the lower part of the Detroit River.

The Eleventh district—From the River Rouge to the head of navigation in Lake Superior.

Inspector Ninth district—Capt. Perry Garst, U. S. N., Chicago, Ill.

Inspector Tenth district—Capt. Perry Garst, U. S. N., Buffalo, N. Y.

Inspector Eleventh district—Com. Herbert Winslow, U. S. N., Detroit, Mich.

Engineer Ninth district—Major James G. Warren, Corps of Engineers, U. S. Army, Milwaukee, Wis.

Engineer Tenth district—Major Theodore A. Bingham, Corps of Engineers, U. S. A., Buffalo, N. Y..

Engineer Eleventh district—Major Lansing H. Beach, Corps of Engineers, U. S. A., Detroit, Mich.

THE LIFE SAVING SERVICE.

Tenth district—Lakes Erie and Ontario.

Eleventh district—Lakes Huron and Superior.

Twelfth district—Lake Michigan.

General Superintendent—Sumner I. Kimball, Washington, D. C.

Superintendents of Construction—Lake districts, Captain Chas. A. Abbey, 17 State street, New York city; Captain John Dennett, 17 State street, New York city.

Assistant Inspectors—Tenth and Eleventh districts, Captain Daniel B. Hodgsdon, Detroit; Twelfth district, Lieutenant Johnstone H. Quinan, Chicago.

District Superintendents—Tenth district, Edwin E. Chapman, Buffalo, N. Y.; Eleventh district, Jerome G. Kiah, Harbor Beach, Mich.; Twelfth district, Chas. Morton, Grand Haven, Mich.

Salaries of District Superintendents, $2,000.00 per annum.

Salaries of Keepers of Stations—$900.00 per season.

Surfman, $65.00 per month.

THE WEATHER BUREAU.

Headed by Professor Willis L. Moore.

Organized at Washington in 1891.

Over 650 paid employes located at nearly 200 stations throughout the United States and West Indies.

It also receives reports of temperature from several hundred special observers and 2,500 voluntary observers of local weather matters.

The bureau receives daily two sets of weather telegrams, at 8 a. m. and at 8 p. m., on which are based the morning and evening weather charts and the forecasts for the next thirty-six hours.

MARINE HOSPITAL SERVICE.

Previous to 1884 a tax of forty cents a month was exacted by law from every person belonging to the crew of an American vessel. This money was used to carry on the work of the Marine Hospital Service. Since 1884 the service has been free. Blank Hospital certificates are furnished to masters of vessels. When a sailor needs medicine or the services of a Marine doctor a blank is filled out and signed by the master. This certificate is then countersigned by the sailor and given in to the Marine Doctor. There are Marine Hospitals in three lake cities and a Marine Physician in almost every lake port of any size. Marine Hospitals and Marine Physicians for the lake ports are as follows:

Marine Hospitals.

Cleveland, Ohio—Passed Asst. Surg. H. S. Mathewson in command.
Detroit, Mich.—Surgeon Fairfax Irwin in command.
Chicago, Ill.—Surgeon G. B. Young in command.

Contract Stations.

Oswego, N. Y—Collector of Customs in charge.
Buffalo, N. Y.—Surgeon D. A. Carmichael in command.
Erie, Pa.—Acting Asst. Surg. W. R. Hunter in charge.
Ashtabula, Ohio—Acting Asst. Surg. H. W. Dorman in charge.
Sandusky, Ohio—Acting Asst.. Surg. A. F. Cook in charge.
Toledo, Ohio—Acting Asst. Surg. C. E. Fisher in charge.
Port Huron, Mich.—Acting Asst. Surg. W. S. Henderson in charge.
Saginaw, Mich.—Acting Asst. Surg. W. J. O'Reilly in charge.
Manistee, Mich.—Acting Asst. Surg. A. A. McLarty in charge.
Ludington, Mich.—Acting Asst. Surg. A. P. McConnell in charge.
Grand Haven, Mich.—Acting Asst. Surg. W. S. Walkey in charge.
Milwaukee, Wis.—Acting Asst. Surg. W. E. Fox in charge.
Cheboygan, Wis.—Acting Asst. Surg. J. C. Elfers in charge.
Manitowoc, Wis.—Acting Asst. Surg. C. M. Gleason in charge.
Green Bay, Wis.—Acting Asst. Surg. A. W. Slaughter in charge.
Menominee, Mich.—Acting Asst. Surg. W. R. Hicks in charge.
Escanaba, Mich.—Acting Asst. Surg. H. B. Reynolds in charge.
Sault Ste. Marie, Mich.—Acting Asst. Surg. F. Townsend in charge.
Marquette, Mich.—Acting Asst. Surg. F. McD. Harkins in charge.
Houghton, Mich.—Acting Asst. Surg. W. S. Jackson in charge.
Ashland, Wis.—Deputy Collector of Customs in charge.
Superior, Wis.—Acting Asst. Surg. L. B. Shehan in charge.
Duluth, Minn.—Acting Asst. Surg. F. O. Sherwin in charge.

UNITED STATES HYDROGRAPHIC OFFICE.

The United States Hydrographic office maintains branch offices on the Great Lakes as follows: Buffalo, Guaranty building; Cleveland, The Arcade; Chicago, Masonic Temple; Sault Ste. Marie, News building; Duluth, Torrey building.

Masters of vessels are invited to call on arrival in port. All services are free. Nautical charts and sailing directions are on hand for inspection. Nautical publications are distributed. Barometers are compared.

MARINE POSTAL SERVICE.

Marine post offices are maintained at Detroit, Mich., and at Sault Ste. Marie, Mich. All letters should be sent 'in care" of your boat.

The Detroit River Postal Service.

It will be necessary for boats desiring mail to enter the American channel, but only at the point of delivery.

Deliveries are made as near the foot of First street as possible, by a launch and small boats, the service being a continuous one, day and night.

When telegrams from passing vessels are handed to the Marine letter carrier, the amount of money accompanying same, in addition to the cost of the message, should be sufficient to attach a two cent postage stamp to same.

Signal for mail boat—One long whistle, one short whistle, one long whistle.

Letters and packages will be received from passing boats for registration, but registered letters and packages cannot be delivered to passing boats, as the necessary receipts and identification cannot be had.

Money orders will be issued to passing boats, blanks are furnished by the carrier.

Registration of Letters and Parcels By Marine Letter Carriers.

Post Office, Detroit, Mich.

To Master and Crews:

Do not send money or other valuable matter in the mails without having it registered. The fee for registering a letter or parcel is eight cents (8c.) in addition to postage.

Registered articles, prepaid at letter rates, which are mailed at and addressed to U. S. Post Office, are insured for their value up to ten ($10) dollars.

Marine letter carriers will register every letter or parcel, not exceeding 4 pounds in weight, if it bear stamps enough to pay the registry fee of 8 cents and the postage; or if the money to buy them is furnished; but

Letters must be enclosed in sealed envelopes strong enough to safely carry contents and be in perfect condition. Parcels must be wrapped and tied so as to be secure and yet admit of an easy examination of their contents.

Each article must bear sender's name and the address to which he wishes his receipt sent, or the article returned in case of non-delivery, and also the full name and address of the person for whom it is intended.

When the article is received by the marine letter carrier, he must paste his receipt for it on this card and give it to the sender, to be carefully preserved by him. Within twenty-four hours another receipt, in due form, will be mailed from the post office to the sender at his address given on the registered letter or parcel. A receipt, signed by the addressee, will also be sent when the letter or parcel is delivered. If either be not received within a rasonable time, the postmaster at Detroit should be notified.

If too much money be furnished to pay postage and fee, when stamps are not attached to an article, or if the article should be found unmailable, the surplus money will be returned to and the sender notified at the address given by him.

Registered letters or parcels can not be delivered to persons on passing vessels, because the person addressed can not be identified and a receipt taken from him by the marine letter carrier.

HOMER WARREN, P. M.

THE UNITED STATES LAKE SURVEY—NOTICE TO MARINERS.

It is the desire of the Lake Survey office to obtain the co-operation of owners, shipmasters, and pilots in its endeavor to gather and authenticate reports of all newly discovered obstructions or menances to navigation.

Investigation of some of the recently discovered shoals have disclosed the fact that knowledge of them has existed among a few of the local navigators for years previous. Had such information been gathered and disseminated, it is probable that serious disasters which have happened, would have been avoided.

Reports are requested of any and all shoals, bars or wrecks, known or supposed to exist, and not shown on the charts issued from this office; also of the positions of derelicts, and of destroyed and displaced piers menacing safe navigation.

This office will endeavor to make an early investigation of these reports, and promptly circulate reliable and detailed information of the results.

It is suggested, if practicable, that navigators drop a buoy where any obstruction is discovered, thus materially aiding in its definite location when subsequent examination is made by the government authorities.

Address all reports to

MAJOR W. L. FISK,
Corps of Engineers, U. S. Army, Detroit, Mich.

Lake Associations and Unions

THE SHIPMASTERS' ASSOCIATION.

The membership of this association is limited to those holding a master's certificate, issued by the United States government.

This association has a membership on the Great Lakes only.

Total membership in 1906, about 900. Fraternal, paying $1,000 death benefits.

Association Headquarters.

Lodge No. 1—Buffalo, N. Y., Chapin block.

Lodge No. 2—Port Huron, Mich., Jenkinson block.

Lodge No. 3—Chicago, Ill., Schlosser building.

Lodge No. 4—Cleveland, Ohio, 122 Water street.

Lodge No. 6—Milwaukee, Wis., 86 Michigan street.

Lodge No. 7—Detroit, Mich., 69 Woodward avenue.

Lodge No. 8—Marine City, Mich., Commercial block.

Lodge No. 9—Toledo, Ohio, Trier building.

Grand Financial Secretary—Capt. E. G. Ashley, Toledo, Ohio.

THE MARINE ENGINEERS' BENEFICIAL ASSOCIATION.

The membership of this association is limited to those licensed as engineers of vessels over 10 tons, by the United States Steamboat Inspection Service, and to those commissioned by the United States in the Navy or Revenue Cutter Service for engineering duty.

This association has membership on all waters of the United States.

Lake membership, 3,000.
Lake Business Manager—Joseph R. Blanchett, Buffalo, N. Y.
National Secretary—George A. Grubb, Chicago, Ill.

Association Headquarters.

Lodge No. 1—Buffalo, N. Y., 10 Exchange street.
Lodge No. 2—Cleveland, O., 122 Water street.
Lodge No. 3—Detroit, Mich., 42 Gratiot avenue.
Lodge No. 4—Chicago, Ill., Revere House.
Lodge No. 9—Milwaukee, Wis., 408 Grand avenue.
Lodge No. 27—Bay City, Mich.., Watson block.
Lodge No. 37—Toledo, O., Mitchell hall.
Lodge No. 39—Erie, Penn., 714 State street.
Lodge No. 43—Port Huron, Mich., 509 Water street.
Lodge No. 44—Manistee, Mich., 393 River street.
Lodge No. 47—Sault Ste. Marie, Mich., Cook block.
Lodge No. 48—Sandusky, O., Columbus, avenue.
Lodge No. 51—Muskegon, Mich., Harkley Bank building.
Lodge No. 53—Marine City, Mich., Hadden's hall.
Lodge No. 55—Cheboygan, Mich., A. O. H. hall.
Lodge No. 67—Saugatuck, Mich.
Lodge No. 72—Oswego, N. Y., corner First and Market streets.
Lodge No. 73—Green Bay, Wis., 321 Washington street.
Lodge No. 75—Alexandria Bay, N. Y., Firemen's hall.
Lodge No. 76—Grand Haven, Mich., cor. Washington and Hall Sts.
Lodge No. 77—Manitowoc, Wis., Frazier's hall
Lodge No. 78—Duluth, Minn., Lyceum building
Lodge No. 85—Alpena, Mich., Maccabee temple.
Lodge No. 86—Marinette, Wis., 18 Hosmer street.
Lodge No. 87—Detroit, Mich., 42 Gratiot avenue.
Lodge No. 88—Sturgeon Bay, Wis., Cedar street.
Lodge No. 89—Ogdensburg, N. Y., 28 Isabella street.
Lodge No. 91—Ashtabula, O., corner Cedar and Elm streets.
Lodge No. 92—Saginaw, Mich., 103 Washington avenue.
Lodge No. 102—South Haven, Mich., French's hall.

LAKE SEAMEN'S UNION.

Total lake membership, over 10,000.

The membership of this association is made up of wheelsmen, watchmen, lookoutsmen, bargemen, deck hands, coal passers, etc.

Apprentices are given a Black Book by the union and serve time aboard a vessel as deck hands or coal passers. They are then given an examination by union officials and if found competent are given a Blue Book, and can then serve as wheelsmen, watchmen, lookoutsmen, or bargemen.

Grand Secretary—Wm. Penje, Chicago, Ill.

Headquarters.

121 and 123 N. Desplaines street, Chicago. Telephone Monroe 1321.

Branches.

Milwaukee—133 Clinton street. Telephone South 240.

Buffalo—55 Main street. Telephone Seneca 936-R.

Ashtabula—87 Bridge street. Telephone 552.

Cleveland—171 E. River street. Telephone (Bell) Main 1295.

Toledo—719 Summit street. Telephone Black 6981.

North Tonawanda—152 Main street. Telephone (Bell) 2762.

Agencies.

Ashland—515 E. Second street. Ashland Phone 1563.
Superior—1721 N. Third street. Phone (Peoples) 4615.
Ogdensburg—94 Hamilton street.
Bay City—919 N. Water street.
Detroit—7 E. Woodbridge street. Telephone, 3724.

Sub-Agencies.

Manitowoc—809 S. Eighth street.
Erie—107 E. Third street. Telephone (Bell) 599 F.
Conneaut—992 Day street.
South Chicago—9142 Mackinac avenue. Telephone 1112 S. C.
Sandusky—1107 Adams street.

MARINE COOKS AND STEWARDS UNION.

Total Lake membership, 5,000. The membership of this association is made up of marine stewards, cooks, porters, etc.

Grand Secretary—B. H. Walker, Buffalo, N. Y.

Headquarters—55 Main street, Buffalo, N. Y.

Branches.

Ashtabula—74 Bridge street.

Cleveland—1 Atwater building.

Chicago—42 Wells street.

Milwaukee—317 Florida street.

Agencies.

Ogdensburg—49 Ford street.

Toledo—15 Calvin building.

Superior—225 Tower avenue

Conneaut Harbor—180 Park avenue.

Sault Ste. Marie—345 Portage avenue.

Port Huron—617 Water street.

MARINE FIREMEN, OILERS AND WATERTENDERS' BENEVOLENT ASSOCIATION.

◆

The members of this association are made up of marine firemen, oilers and watertenders.

Lake membership over 6,000.
Edward Stack, President.
Michael Casey, Secretary.
Geo. H. Kennedy, Attorney.
B. C. Ralph, Treasurer.
Headquarters, 71 Main Street, Buffalo, N. Y.

The Licensed Officers of the Steamers of the Great Lakes

MASTERS, MATES, PILOTS, AND ENGINEERS.

All officers of American steamers must be American citizens.

Masters and mates of lake steamers are licensed pilots.

An applicant for a license to act as an officer on an American lake steamer shall be examined by the local board of inspectors of steam vessels for the district in which he resides.

Inspectors will not issue licenses to pilots who cannot read and write.

Inspectors will not issue or renew licenses to officers who cannot properly hear the bell and whistle signals.

Applicants for license as master, mate or pilot, must have the certificate of a surgeon of a Marine Hospital Service to show that they are free from color blindness.

Any applicant for license who has been examined and refused may be re-examined after one year has expired.

An applicant for license must make a written application upon the blank form authorized by the board of Supervising Inspectors.

An applicant for pilots license must also have the written endorsement of the master and engineer of a vessel upon which he has served, and of one licensed pilot, as to his qualifications.

An applicant for an original engineers license must have the endorsement of the master and engineer of a vessel upon which he has served, together with the endorsement of one other licensed engineer.

An officers license is good for five years service, but if an examination is passed before the original license has expired, entitling him to a raise of grade, a new license of a higher grade will be given him by the inspectors.

The grade of no license can be raised unless the applicant can show one year's actual service on his former license.

If an officer loses his license the inspector will issue him a certificate that shall have the authority of the lost license for the unexpired term.

Whenever an officer shall apply for a renewal of his license at the expiration of the five years, the presentation of the old certificate shall be considered sufficient evidence of his title to a renewal, provided that it is presented within twelve months after the date of its expiration.

But no actual service is allowed on an expired license.

The local inspectors can revoke or suspend an officers license for reason, and the license must be surrendered to them.

A fair trial is given all such accused.

No officer can serve aboard a steamer in his official capacity while his license is suspended or revoked.

The inspectors have the authority to determine the term of the duration of a suspension, except that such suspension can not extend beyond the time for which the license was issued.

PILOTS.

Applicants for original licenses as pilots must have had at least three years experience as a sailor aboard a steam vessel, sail vessel, or barge consort.

The examination for pilot shall be in regard to his knowledge of lights, lighthouses, channels, buoys, obstructions, courses, distances, etc., over the waters asked for in his application. He shall also be examined as to his knowledge of the rules and regulations for the government of steam vessels, the running and anchor lights, fog signals, the use of the lead line, signal bells between the engine room and pilot house, etc., etc.

The navigation of every steamer above 100 gross tons shall be under the control of a first class pilot.

A second class pilot may take charge of a watch, provided his license shows the endorsement of the inspectors to that effect.

A second class pilot may take charge of a steamer not exceeding 100 gross tons.

Any person holding a license as first class pilot of lake steamers may have his license endorsed to act as chief mate of coastwise steamers.

MASTERS.

No license as master of lake steamers will be issued to any person who has not served one year as first class pilot or chief mate on lake steamers.

Or three years as master of sail vessels.

Or three years as master of barge consorts while holding a first class pilot's license.

Any person having had three years actual experience as master of lake steam vessels of 1,000 gross tons or over may be examined for license as chief mate of ocean steamers, and after having had one year's actual experience as chief mate of ocean steamers of 1,000 tons or over may be examined as master of ocean steamers.

The following line of examination shall be given applicants for license as masters of lake steam vessels.

As to his general knowledge of the duties of master of steam vessels.

As to the knowledge of his duties and proper method of procedure in case of fire on his vessel.

As to his knowledge of proper management of vessel and crew in case of collision and sinking.

As to his executive ability generally to manage officers and crew.

As to his knowledge and ability to navigate steamers with safety to life and property.

As to his knowledge of pilot rules governing the navigation of lake steamers.

As to his knowledge of signals between the pilot house and engine room.

As to his knowledge of signal lights and their proper position on steam and all other vessels.

As to duties of a master in case of fog or stormy weather, and on such other subjects in connection with the navigation of lake vessels as the inspectors may deem proper and necessary.

ENGINEERS.

No person shall receive an original license as engineer or assistant engineer who has not served at least three years in the engineers department of a steam vessel, a portion of which experience must have been obtained within the three years next preceding the application.

But any person may be licensed to serve as an engineer of steam vessels after having had one year's experience in the engine department of steam vessels, provided he has served three years as apprentice to the machine trade in a marine, stationary, or locomotive engine works, or has served for not less than three years as a locomotive or stationary engineer, or has graduated as a mechanical engineer from duly recognized school of technology.

No original license shall be granted to any engineer or assistant engineer who cannot read and write and does not understand the plain rules of arithmetic.

Engineers of all classifications may be allowed to pursue their profession upon all waters of the United States in the class for which they are licensed.

Any person holding chief engineer's license shall be permitted to act as first assistant on any steamer of double the tonnage of same class named in the said chief's license.

Engineers of lake steamers who have actually performed the duties of engineer for a period of three years, shall be entitled to examination for engineer of ocean steamers.

Any assistant of ocean steamers of 1,500 gross tons or over, having had actual service in that position for one year, may have his license indorsed to act as chief engineer of lake steamers of 750 gross tons or under.

Any person having had a first assistant engineer's license for two years and having had two years experience as second assistant engineer, shall be eligible for examination for chief engineer's license.

Any person having had a second assistant engineer's license for two years, and having had two years experience as third assistant engineer, shall be eligible for examination for first assistant engineer's license.

First, second, and third assistant engineers may act as such on any steamer of the grade of which they hold license, or as such assistant engineer on any steamer of a lower grade than those to which they hold a license.

Any person having a third assistant engineer's license for two years, and having had two years experience as oiler or water tender since receiving said license, shall be eligible for examination for second assistant engineer's license.

Any assistant engineer may act as engineer in charge of a steamer of 100 tons and under.

Any person holding a license as engineer of steam vessels, desiring to act as engineer of motor vessels, must be examined by the local inspectors as to his knowledge of the machinery of a motor vessel, and if found qualified shall be licensed as engineer of motor vessels.

SECTIONS OF REVISED STATUTES AND OF RULES AND REGULATIONS RELATING TO LICENSED OFFICERS OF STEAMBOATS.

The following sections of the Revised Statutes and extracts from the Revised Rules and Regulations of the Board of Supervising Inspectors are published herewith for the information of licensed officers; and their special attention is invited to the penalties to which they render themselves liable by noncompliance with the provisions thereof:

Sec. 4445, Revised Statutes.—Every master, chief mate, engineer, and pilot, who receives a license, shall, before entering upon his duties, make oath before one of the inspectors herein provided for, to be recorded with the certificate, that he will faithfully and honestly, according to his best skill and judgment, without concealment or reservation, perform all the duties required of him by law.

Every applicant for license as either master, mate, pilot or engineer under the provisions of this title shall make and subscribe to an oath or affirmation, before one of the inspectors referred to in this title, to the truth of all statements set forth in his application for such license.

Any person who shall make or subscribe to any oath or affirmation authorized in this title and knowing the same to be false shall be deemed guilty of perjury.

Every licensed master, mate, pilot, or engineer who shall change, by addition, interpolation, or erasure of any kind, any certificate or license issued by any inspector or inspectors referred to in this title shall, for every such offense, upon conviction, be punished by a fine of not more than five hundred dollars or by imprisonment at hard labor for a term not exceeding three years.

Sec. 4446, Revised Statutes.—Every master, mate, engineer, and pilot who shall receive a license shall, when employed upon any vessel, place his certificate of license, which shall be framed under glass, in some conspicuous place in such vessel, where it can be seen by passengers and others at all times; and for every neglect to comply with this provision by any such master, mate, engineer, or pilot, he shall be subject to a fine of one hundred dollars, or to the revocation of his license.

Sec. 4465, Revised Statutes.—It shall not be lawful to take on board of any steamer a greater number of passengers than is stated in the certificate of inspection; and for every violation of this provision the master or owner shall be liable, to any person suing for the same, to forfeit the amount of passage-money and ten dollars for each passenger beyond the number allowed.

Sec. 4467, Revised Statutes.—The master of every passenger-steamer shall keep a correct list of all the passengers received and delivered from day to day, noting the places where received and where landed, which record shall be open to the inspection of the inspectors and officers of the customs at all times; and the aggregate number of passengers shall be furnished to inspectors as often as called for; but on routes not exceeding one hundred miles, the number of passengers, if kept, shall be sufficient.

Sec. 4468, Revised Statutes.—Every master of any passenger-steamer who fails, through negligence or design, to keep a list of passengers, as required by the preceding section, shall be liable to a penalty of one hundred dollars.

Sec. 4441, Revised Statutes.— * * * Whenever complaint is made against any engineer holding a license authorizing him to take charge of the boilers and machinery of any steamer, that he has, through negligence or want of skill, permitted the boilers in his charge to burn or otherwise become in bad condition, or that he has not kept his engine and machinery in good working order, it shall be the duty of the inspectors, upon satisfactory proof of such negligence or want of skill, to revoke the license of such engineer and assign him to a lower grade or class of engineers, if they find him fitted therefor.

Sec. 14, Rule IX, Rules and Regulations.—When it is known or comes to the knowledge of the local inspectors that any steam vessel is or has been carrying an excess of steam beyond that which is allowed by her certificate of inspection, the local inspectors in whose district said steamer is being navigated, in addition to reporting the fact to the United States district attorney for prosecution under section 4437, Revised Statutes of the United States, shall require the owner or owners of said steamer to place on the boiler of said steamer a lockup safety valve that will prevent the carrying of an excess of steam and shall be under the control of said local inspectors.

On the placing of a lockup safety valve upon any boiler, it shall be the duty of the engineer in charge of same to blow or cause the said valve to blow off steam at least once in each watch of six hours or less, to determine whether the valve is in working order, and it shall be the duty of the master of such vessel to see that this rule is observed, and it shall be the duty of the master and engineer to report to the local inspectors any failure of such valve to operate.

In case no such report is made, and a safety valve is found that has been tampered with or out of order, the license of the engineer having such boiler in charge and the license of the master of such vessel shall be suspended or revoked.

It shall be the duty of the local inspectors to send a copy of this rule to every steamer in their district when said copies are furnished by the Department.

Sec. 4448, Revised Statutes.—All officers licensed under the provisions of this Title shall assist the inspectors in their examination of any vessel to which such licensed officers belong, and shall point out all defects and imperfections known to them in the hull, equipment, boilers, or machinery of such vessel, and also shall make known to the inspectors, at the earliest opportunity, all accidents or occurrences producing serious injury to the vessel, her boilers, or machinery; and in default thereof the license of any such officer so neglecting or refusing shall be revoked.

Sec. 22, Rule V, Rules and Regulations.—Before making general repairs to a boiler of a steam vessel the engineer in charge of such steamer shall report, in writing, the nature of such repairs to the local inspector of the district wherein such repairs are to be made.

And it shall be the duty of all engineers when an accident occurs to the boilers or machinery in their charge tending to render the further use of such boilers or machinery unsafe until repairs are made, or when, by reason of ordinary wear, such boilers or machinery have become so unsafe to report the same to the local inspectors immediately upon the arrival of the vessel at the first port reached subsequent to the accident, or after the discovery of such unsafe condition by said engineer.

Sec. 23, Rule V, Rules and Regulations.—Whenever a steamer meets with an accident involving loss of life or damage to property it shall be the duty of the licensed officers of any such steamer to report the same in writing and in person without delay to the nearest board: Provided, That when from distance it may be inconvenient to report in person it may be done in writing only and the report sworn to before any person authorized to administer oaths.

Sec. 5344, Revised Statutes.—Every captain, engineer, pilot, or other person employed on any steamboat or vessel, by whose misconduct, negligence, or inattention to his duties on such vessel the life of any person is destroyed, and every owner, charterer, inspector, or other public officer, through whose fraud, neglect, connivance, misconduct, or violation of law, the life of any person is destroyed, shall be deemed guilty of the felony of manslaughter, and upon conviction thereof, before any circuit court of the United States, shall be sentenced to pay a fine of not more than ten thousand dollars, or to confinement at hard labor for a period of not more than ten years, or either, or both: Provided, That when the owner or charterer of any steamboat or vessel shall be a corporation, any executive officer of such corporation, for the time being actually charged with the control and management of the operation, equipment, or navigation of such steamboat or vessel, who has knowingly and wilfully caused or allowed such fraud, neglect, connivance, misconduct, or violation of law, by which the life of any person is destroyed, shall be deemed guilty of the felony of manslaughter, and upon conviction thereof, before any circuit court of the United States, shall be sentenced to confinement at hard labor for a period of not more than ten years.

The attention of masters and mates of steam vessels is particularly directed to the following rules of the Board of Supervising Inspectors, relating to the duties of masters and mates:

Sec. 50, Rule V, Rules and Regulations.—It shall be the duty of the officer in charge of every steamer carrying passengers to cause to be prepared a station bill for his own department, and one also for the engineer's department, in which shall be assigned a post or station of duty for every person employed on board such steamer in case of fire or other disaster; which station bills shall be placed in the most conspicuous places on board for the observation of the crew. And it shall be the duty of such master, or of the mate or officer next in command, once at least in each week, to call all hands to quarters and exercise them in the discipline, and in the unlashing and swinging out of the lifeboats, weather permitting, and in the use of the fire pumps and all other apparatus for the safety of life on board of such vessel, with especial regard for the drill of the crew in the method of adjusting life-preservers and educating passengers and others in this procedure, and to see that all the equipments required by law are in complete working order for immediate use; and the fact of the exercise of the crew, as herein contemplated, shall be entered upon the steamer's log book, stating the day of the month and hour when so exercised; and it shall be the duty of the inspectors to require the officers and crew of all such vessels to perform the aforesaid drills and discipline in the presence of the said inspectors at intervals sufficiently frequent to assure the said inspectors by actual observation that the foregoing requirements of this section are complied with; the master shall also report monthly to the local inspectors the day and date of such exercise and drill, the condition of the vessel and her equipment, and also the number of passengers carried, and any neglect or omission on the part of the officer in command of such steamer to strictly enforce this rule shall be deemed cause for the suspension or revocation of the license of such officer. Three copies of this section shall be furnished every steamer carrying passengers, to be framed under glass and posted in conspicuous places about the vessel.

Sec. 51, Rule V, Rules and Regulations.—It shall be the duty of the mate of every inland or river steamer carrying passengers to assign to deck or steerage passengers the space they may occupy on board during the voyage, and to supervise the stowage of freight or cargo, and see that the space set apart for passengers is not encroached upon. He shall also carefully examine all packages of freight delivered on board for shipment, with a view to detect and prevent any combustible or other dangerous articles prohibited by law being delivered on board. Three copies of this section shall be furnished every steamer to which this section applies, to be framed under glass and posted in conspicuous places about the steamer, one of which shall be on the main deck.

The attention of officers named therein is particularly directed to the following rule relating to the use of searchlights:

Sec. 10, Rule X, Rules and Regulations.—Any master or pilot of any steam vessel who shall flash or cause to be flashed the rays of the searchlight into the pilot house of a passing vessel shall be deemed guilty of misconduct and shall be liable to have his license suspended or revoked.

Sec. 4413, Revised Statutes.—Every pilot, engineer, mate, or master of any steam-vessel who neglects or willfully refuses to observe the regulations established in pursuance of the preceding section (Regulations to be observed by all steam vessels and by other vessels propelled by machinery in passing each other) shall be liable to a penalty of fifty dollars, and for all damages sustained by any passenger, in his person or baggage, by such neglect or refusal.

(Applies on rivers whose waters flow into the Gulf of Mexico and their tributaries, and the Red River of the North.)

Sec. 3, Act of Congress approved June 7, 1897, To adopt regulations for preventing collisions upon certain harbors, rivers, and inland waters of the United States.—That every pilot, engineer, mate, or master of any steam-vessel, and every master or mate of any barge or canal-boat, who neglects or refuses to observe the provisions of this Act, or the regulations established in pursuance of the preceding section (Rules to be observed by steam vessels and by other vessels propelled by machinery in passing each other, and as to the lights to be carried by ferryboats and by barges and canal boats when in tow of steam vessels), shall be liable to a penalty of fifty dollars, and for all damages sustained by any passenger in his person or baggage by such neglect or refusal: Provided, That nothing herein shall relieve any vessel, owner or corporation from any liability incurred by reason of such neglect or refusal.

(Applies on the inland waters of the Atlantic and Pacific coasts.)

Sec. 2, Act of Congress approved February 8, 1895, To regulate navigation on the Great Lakes and their connecting and tributary waters.—That a fine, not exceeding two hundred dollars, may be imposed for the violation of any of the provisions of this Act. The vessel shall be liable for the said penalty, and may be seized and proceeded against, by way of libel, in the district court of the United States for any district within which such vessel may be found.

Sec. 4500, Revised Statutes.—The penalty for the violation of any provision of this Title (LII, Regulation of Steam Vessels), not otherwise specially provided for, shall be a fine of five hundred dollars, recoverable one-half for the use of the informer.

Licensed officers are notified that in case of the loss of their license, through any cause, they can obtain a certificate of such loss (Form 892) to take the place of the lost license, which certificate will hold good until the date of expiration of the lost or destroyed license, or until the grade of license is raised, in which case the certificate may be surrendered and a new license issued indicating the new grade.

THE EQUIPMENT REQUIRED BY LAW ON A LAKE FREIGHT STEAMER.

Emergency steering gear.

One life-preserver for each and every person allowed to be carried on the steamer by the certificate of inspection.

Every life preserver must be made of good block cork.

Every life preserver must contain at least six pounds of cork, and must be at least 52 inches in length, and capable of sustaining a weight having a direct downward pull of at least twenty pounds.

Freight steamers must have an equipment of buckets, barrels and axes, as follows: (Gross tons used in all the following tables.)

All steamers not over 10 tons, 1 axe, 2 buckets.

All steamers over 10 tons and not over 25 tons, 1 axe, 4 buckets,

All steamers over 25 tons and not over 50 tons, 1 barrel, 2 axes, 6 buckets.

All steamers over 50 tons and not over 100 tons, 1 barrel, 2 axes, 8 buckets.

All steamers over 100 tons and not over 200 tons, 1 barrel, 2 axes, 12 buckets.

All steamers over 200 tons and not over 500 tons, 2 barrels, 3 axes, 15 buckets.

All steamers over 500 tons and not over 1,000 tons, 3 barrels, 4 axes, 20 buckets.

All steamers over 1,000 tons, 4 barrels, 5 axes, 25 buckets.

Tanks of suitable dimensions, or buckets in sufficient number, may be substituted for barrels on all vessels. Five buckets shall be considered equal to one barrel.

Buckets, barrels, or tanks must be constantly filled with water and in such positions on board as shall be most convenient for use in case of fires.

Axes must not be used for general purposes.

Steam pipes not less than 1½ inches in diameter must run from the boiler to the hold and into each separate compartment of the hold, to be used in case of fire.

Steam pipes not less than ¾ of an inch in diameter must be led to all lamp lockers, oil rooms, etc.

The valves of these steam fire extinguishers must be placed in the most accessible part of the main deck, and each one plainly marked to indicate the parts of the vessel to which they lead. Over the row of valves must be put the words "Steam fire apparatus."

All lamp lockers and oil rooms must be lined with metal.

All hose required for fire purposes shall be tested to a pressure of 100 pounds to the square inch at each inspection.

Fire hose must be not less than 1½ inches in diameter.

Hose couplings must be of the U. S. Standard make.

One hose wrench must be hung with a chain at each main.

Fire mains must be led from the pumps to all decks, so arranged that any part of the steamer can be reached with water with the full capacity of the pumps, and by means of a single 50-foot length of hose from at least one of said outlets.

Steamers of 15 tons and under may use fire hose of ¾ of an inch in diameter.

Freight steamers must have life boats of sufficient capacity to carry the crew with safety.

The capacity of life boats shall be determined by the following rule: Measure the length and breadth outside of the planking and the depth inside at the place of least depth. Then multiply the length by the breadth and then multiply by the depth. The result multiplied by .6 (6-10) will give the capacity of the boat in cubic feet.

To determine the number of passengers this boat will be allowed to carry, for lake boats divide the result by 10; for river boats divide by 8.

For example:

A boat is 20 feet long, 6 feet wide, 2½ feet deep. 20×6×2½×.6=180 cubic feet. 180÷10=18 persons for lake steamers. 180÷8=22 persons for river steamers.

Life boats must have the following equipment:

Two life lines, 1 boat painter of Manilla rope not less than 2¾ inches in circumference, a full complement of oars, a steering oar, and 2 spare oars. Steering oar must have row lock and becket. A rudder with suitable yoke ropes can be used instead of a steering oar. 1 boat hook, 1 bailing bucket with lanyard attached, 2 plugs for each drain hole on wooden boats. Plugs must be attached with a lanyard. 2 life preservers in each boat.

Life boats must be carried from davitts or cranes. These davitts and cranes with their ropes and blocks must be of sufficient strength to carry the boat with its full load.

Life boats must be overhauled and painted at least once a year.

Life boat ropes and tackles must not be painted.

Cubical contents of each life boat must be painted on the stem in black letters on white back ground. Letters and figures to be not less than ¾ of an inch in height.

All equipments of a steamer, such as buckets, boats, axes, oars, rafts, life preservers, floats, barrels, and tanks, shall be branded with the name of the steamer upon which they are used.

Each compartment of the hold of all steamers must have a sounding pipe.

A steam siphon or bilge pump pipe must also be in each compartment.

All steam fire pumps must be arranged so that they may be used for pumping and discharging water overboard from the hold.

Steamers using the gong signals between the pilot house and engine room shall have a tube, of proper size, so arranged as to return the sound of the gong to the pilot house, and must also be provided with a speaking tube or other device for the purpose of conversation between the pilot house and engine room.

When the so-called engine telegraph is used the signal must always be repeated back.

Motor vessels, other than steam vessels, shall be provided with a whistle to be blown by compressed air or other power, to give the necessary signals to passing vessels.

The fog bell required by law on lake freighters must be not less than eight inches in diameter.

All steam whistles shall be placed on the forward side of the smokestack, not less than six feet above the top of the pilot house, where the height of the smokestack will admit of this without the whistle extending above the top of the smokestack.

On steamers where the distance is more than 150 feet between deck houses, a wire cable shall be stretched between the deck houses at all times when the vessel is loaded and being navigated, this cable to be not less than 5 feet from the deck; and there shall be attached at all times to the cable a traveler with a line of sufficient continuous length to insure its operation, in order that communication between both ends of the vessel may be facilitated at all times. Failure to have such cable stretched and traveler attached at all times when the vessel is loaded and being navigated shall be sufficient cause for the suspension of the license of the master or officer in charge.

On all steamers where the distance is more than 150 feet between perpendiculars of pilot house and forward part of the engine room, there shall be communication by means of a telephone between the pilot house and engine room, such telephone to be installed in lieu of a speaking tube.

Freight and towing steamers of over 250 tons shall be provided with chemical fire extinguishers as hereafter prescribed, viz:

	Fire Extinguishers.
Steamers from 250 to 500 tons	1
Steamers over 500 tons	2

All chemical fire extinguishers thus provided for shall be able to withstand a pressure of 350 pounds to the square inch, except such fire extinguishers as have no stopcock or valve between the chamber and discharge, in which case they may be used after having been tested to 150 pounds pressure to the square inch.

THE EQUIPMENT REQUIRED ON PASSENGER STEAMERS.

The equipment for by law on passenger steamers is, for the most part, the same as that required for freighters. The following articles are required for passenger steamers in addition to those mentioned for freight steamers.

Ladders for passengers to descend to the life boats.

Not less than three water tight cross bulkheads.

Portable chemical fire extinguishers as follows:

Steamers under 50 tons	1 fire extinguisher
Steamers from 50 to 100 tons	2 fire extinguishers
Steamers from 100 to 500 tons	3 fire extinguishers
Steamers from 500 to 1000 tons	6 fire extinguishers
Steamers over 1000 tons	8 fire extinguishers

All chemical fire extinguishers shall be able to withstand a pressure of 300 pounds to the square inch, except such as have no stop cock or valve between the chamber and discharge, in which case they may be used after having been tested to 150 pounds pressure to the square inch.

The barrels, buckets, and axes on passenger steamers must be as follows:

All passenger steamers not over 10 tons	2 buckets, 1 axe
Over ten gross tons and not over 25 tons	4 buckets, 1 axe
Over 25 gross tons and not over 50 tons	1 barrel, 6 buckets, 2 axes
Over 50 gross tons and not over 100 tons	1 barrel, 8 buckets, 2 axes
Over 100 gross tons and not over 200 tons	2 barrels, 18 buckets, 4 axes
Over 200 gross tons and not over 500 tons	4 barrels, 24 buckets, 6 axes
Over 500 gross tons and not over 1000 tons	6 barrels, 35 buckets, 8 axes
All steamers over 1000 tons	8 barrels; 50 buckets, 10 axes

CAPTAIN RILEY BURRINGTON
One of the Best Known Georgian Bay Pilots

The cubical capacity of life boats on passenger steamers on the lakes shall be as follows:

Gross Tons. Vessels over	Capacity of Boats.	Gross Tons. Vessels over	Capacity of Boats.
150 and not over 200	360	2000 and not over 2500	1620
200 and not over 300	540	2500 and not over 3000	1800
300 and not over 400	720	3000 and not over 3500	1980
400 and not over 500	900	3500 and not over 4000	2160
500 and not over 1000	1080	4000 and not over 4500	2340
1000 and not over 1500	1260	4500 and not over 5000	2835
1500 and not over 2000	1440	5000 and not over 5500	3330

FERRY BOATS.

Ferry boats also require the equipment as given for freight and passenger steamers, with the following changes or additions:

The cubical contents of life boats also for ferry boats shall be as follows:

	Cubic Ft.
Ferry boats over 49 and not over 100 gross tons	120
Ferry boats over 100 and not over 150 gross tons	240
Ferry boats over 150 and not over 300 gross tons	360
Ferry boats over 300 and not over 450 gross tons	480
Ferry boats over 450 and not over 600 gross tons	600
Ferry boats over 600 and not over 900 gross tons	720
Ferry boats over 900	840

On all ferry boats of more than 300 gross tons one-half the boat capacity required may be substituted by its equivalent in approved life rafts or collapsible life boats.

Ferry boats of less than 50 gross tons shall be equipped with boats or rafts as in the opinion of the inspectors may be necessary in case of disaster to secure the safety of all persons on board.

All ferry boats shall be equipped with a life preserver for every seven square feet of passenger deck surface on single-deck ferry boats and for every twelve feet of such deck surface on ferry boats having more than one passenger deck.

AMERICAN PORTS ON THE GREAT LAKES THAT HAVE CUSTOMS OFFICERS.

Algonac.
Alpena.
Allouez.
Ashland.
Ashtabula.
Bay City.
Bayfield.
Benton Harbor.
Buffalo.
Charlevoix.
Chicago.
Cheboygan.
Cleveland.
Conneaut.
Detroit.
Detour.
Duluth.
Dunkirk.
Elk Rapids.
Erie.
Escanaba.
Fair Haven.
Fairport.
Frankfort.
Grand Haven.
Grand Marais, Mich.
Gladstone.
Green Bay.
Grosse Isle.
Harbor Beach.
Holland.
Houghton.
Huron.
Isle Royale.
Kelley Island.
Kenosha.
Kenwaunee.
Lake Linden.
Lorain.
Ludington.
Mackinac Island.
Marine City.
Marysville.
Marquette.
Marinette.
Manistee.
Manistique.
Manitowoc.
Menominee.
Milwaukee.
Michigan City.
Mount Clemens.
Munising.
Muskegon.
North Tonawanda.
Oscoda.
Oshkosh.
Oswego.
Port Clinton.
Port Huron.
Port Ontario.
Point Aux Frenes.
Presque Isle (Lake Superior).
Racine.
Roberts Landing.
Saginaw.
Sandusky.
Sault Ste. Marie.
Sodus Point.
South Haven.
South Chicago.
Sheboygan.
St. Clair.
St. Ignace.
St. Joseph.
Sturgeon Bay.
Superior.
Toledo.
Tonawanda.
Trenton.
Traverse City.
Two Harbors.
Vermillion.
Washburn.
Waukegan.
Wyandotte.

CANADIAN PORTS ON THE GREAT LAKES THAT HAVE CUSTOMS OFFICERS.

Amherstburg.
Algoma Mills.
Bath.
Belleville.
Bridgeburg.
Bruce Mines.
Byng Inlet.
Chatham.
Courtright.
Cobourg.
Collingwood.
Deseronto.
Fort William.
Gananoque.
Goderich.
Hamilton.
Kincardine.
Kingston.
Kingsville.
Leamington.
Little Current.
Meaford.
Midland.
Michipicoten.
Morrisburg.
Niagara.
Oakville.
Owen Sound.
Parry Sound.
Picton.
Penetanguishene.
Point Edward.
Port Arthur.
Port Burwell.
Port Colborne.
Port Credit.
Port Dalhousie.
Port Stanley.
Pellee Island.
(west dock.)
Rondeau.
Sarnia.
Sault Ste. Marie.
Southhampton.
Spanish River.
Thessalon.
Toronto.
Thorold.
Trenton.
Wallaceburg.
Walkerville.
Welland.
Whitby.
Wiarton.
Windsor.

CANADIAN PORTS ON THE GREAT LAKES THAT HAVE AMERICAN CONSULS.

Amherstburg.
Belleville.
Chatham.
Collingwood.
Cornwall.
Courtright.
Deseronto.
Fort Erie.
Fort William.
Goderich.
Hamilton.
Kingston.
Montreal.
Niagara Falls.
Owen Sound.
Parry Sound.
Picton.
Port Hope.
Port Rowan.
Quebec.
Sarnia.
Sault Ste Marie.
Toronto.
Wallaceburg.
Wiarton.
Windsor.

LAWS

LAWS RELATING TO ENTRANCE AND CLEARANCE OF FOREIGN VESSELS AT AMERICAN PORTS.

Revised Statutes, Sec. 3109:

"Master" must sign all oaths before Collector to enter or clear vessels.

R. S. Sec. 2768:

The word "master" may include any person having the chief charge or command of the employment and navigation of a vessel.

R. S. Sec. 2766:

The word "merchandise" may include goods, wares, and chattels of every description capable of being imported.

R. S. Sec. 2771:

Vessels which are not of the United States can unlade at a port of entry.

R. S. Sec. 2773:

Cannot depart from a port after arrival without report or entry at the Custom House.

R. S. Sec. 2774:

Master must report verbally within 24 hours after arrival from a foreign port to chief officer of Customs during office hours and must make written report within 48 hours and in any event must file written report before permits can issue to unlade cargo.

R. S. Sec. 2775:

Must make special report in writing of all spirit and wines on board as cargo and sea stores and all spirits omitted from report is forfeited.

R. S. Sec. 2795:

Master must specify sea stores in report or manifest made by him on entry of vessel from a foreign port and duty may be collected on excessive stores.

R. S. Sec. 2796:

If a greater quantity is found than shown on manifest or if any are landed without permit from Collector such articles are forfeited and master liable to penalty of three times the value of the articles omitted or landed.

R. S. Sec. 2806:

No merchandise shall be brought in the United States from a foreign port unless the master has on board manifests in writing of such cargo signed by such master, viz: Name of the ports where merchandise is laden. Name of the ports in the United States where merchandise is destined. Name, description, build of vessel, tonnage, port of hail, name of owner and name of master. A particular account of the merchandise so laden on board whether in packages or loose, of every kind and nature, marks and numbers, etc., names of the persons to whom such packages are respectively consigned agreeably to the bills of lading unless consigned 'to order' when it shall be so stated, "an account of the sea stores."

Names of the passengers and an account of the baggage belonging to them.

R. S. Sec. 2809:

For failure to have correct manifest, except by accident or mistake, master liable to penalty equal to value of such merchandise not included and all such merchandise not included and consigned to master or crew shall be forfeited.

R. S. Sec. 2811:

Master must produce written manifest to officer of Customs who first comes on board after arrival.

Act March 2, 1895, Sec. 9:

Master must mail a true copy of foregoing manifest to Auditor of Treasury Department, Washington, before signing oaths on an entry of vessel from a foreign port, before Collector of Customs. Envelopes furnished by U. S. postage paid by master.

R. S. Sec. 2867:

Must obtain permit before unloading any cargo, passengers or baggage.

R. S. Sec. 2872:

Can only unlade in open day between rising and setting of sun.

R. S. Sec. 2871:

Must have license under bond from Collector to unlade at night.

R. S. Secs. 2883-4-5-6-7:

Special permits and inspection in case of landing spirits, wines, etc.

R. S. Secs. 2875-6-7-8-9:

Inspectors must remain on board during unlading of cargo.

R. S. Sec. 2888:

When merchandise is delivered complete, Inspector will make written report and vessel can then clear.

R. S. Sec. 2891:

Vessel arriving in distress can have certain privileges upon master making protest, goods and merchandise can be stored on shore and reladen same in case of obstruction by ice.

R. S. Sec. 2798:

Master may retain all coal on board and proceed.

R. S. Sec. 2803:

Any baggage or personal effects in transit to a foreign country may be delivered to Collector and by him delivered to persons on departure for foreign destination; or may remain on board of vessel at option of Collector.

R. S. Sec. 2779:

May proceed to other districts in the United States with merchandise destined for such districts.

R. S. Sec. 2780:

Must obtain copy of report at port of first arrival provided departure is not within 48 hours for such other district.

R. S. Sec. 2781:

Within 24 hours after arrival within any other district, master shall report to or with collector showing copy of manifest obtained from collector in other districts.

R. S. Sec. 2782:

Master must give bond to deliver merchandise in other districts.

R. S. Sec. 2784:

If master neglects to obtain copy of manifest and report or neglects to deliver same to collectors in other districts. $500 penalty.

R. S. Sec. 2785:

The owner or consignee of any merchandise on board shall enter same within 15 days after report by master.

R. S. Sec. 2776:

May proceed with any merchandise brought in her and shown on manifest delivered to Collector within 48 hours after arrival as destined for any foreign port, upon bond being given as in R. S. Sec. 2777.

R. S. Sec. 3110:

No merchandise shall be laden at a United States port into a foreign vessel and transported to another United States port even though re-shipped at a foreign port into another vessel, etc.

Act of June 19, 1886, Sec. 8:

Act February 17, 1898, Sec. 2:

No foreign vessel shall transport passengers between ports or places in the United States either directly or by way of a foreign port. Penalty $200 for each passenger.

Permission must be obtained from United States Collector of Customs for a foreign vessel to enter Lake Michigan.

All blank 'oaths' upon entry or clearance and envelopes to mail copy of manifest to Auditor of the Treasury at Washington can be obtained at Custom House and may be completed by purser but must be signed and sworn to by master in presence of Custom officer.

LAWS RELATING TO THE ENTRANCE AND CLEARANCE OF AMERICAN VESSELS AT CANADIAN PORTS.

All foreign vessels trading on the coast and entering the harbors of Canada from sea or inland waters, are governed by the following rules:—

Section 1. Foreign vessels may transport cargo and passengers from a foreign port and land the same at two or more Canadian ports, clearing from each in succession until all of said cargo and passengers are landed.

Sec. 2. Foreign vessels may take cargo and passengers from two or more Canadian ports and transport the same to a foreign port, clearing from each in succession, but taking final clearance for such foreign port at the last Canadian port which they enter on such voyage.

Sec. 3. Foreign vessels shall not take freight or passengers at one Canadian port and land the same at another Canadian port, and the master or owner of any vessel found to have violated this rule shall be subject to a penlty of $400 for each such offense, and the vessel may be detained until the same is paid.

Sec. 4. Foreign vessels bringing cargo or passengers from a foreign port may, after landing the same, be permitted to clear light to another Canadian port for the purpose of loading cargo for a foreign port, and may clear from port to port to complete such cargo, taking final clearance as above.

Sec. 5. Foreign vessels may tow other vessels or things from a foreign port to a Canadian port; but if they drop or part from any such vessel or thing in Canadian waters, they shall not again take such vessel or thing in tow for the purpose of moving the same further in Canadian waters.

Sec. 6. Foreign vessels may tow other vessels or things from a Canadian port to a foreign port, but having parted from such vessels of things, or any of them, in Canadian waters, they cannot again take such vessels or things in tow to move them further in Canadian waters; but this and the preceding rule are not to apply to an accidental parting of such vessel by breaking hawser or other temporary damages.

Sec. 7. Foreign vessels shall be entitled to the foregoing privileges only on condition of strict compliance with the provisions of "The Customs Act," respecting reporting inwards and outwards on entering and leaving Canadian ports by the masters of such vessels.

Sec. 8. Where vessels bring cargo or passengers from a foreign port consigned to more than one Canadian port, the masters of such vessels must make a full report of the whole contents at the first port of entry, and distinguish therein the items to be there landed and the ports at which all other items are to be landed. Such report must be made in duplicate, with an additional copy for each succeeding port at which there are goods to be landed; and the collector or proper officer of Customs shall mark each item in such report with the entry number, if entered, and in case of any item landed and placed in sufferance warehouse without entry, it shall be marked with the letter "L" in the said report; duplicate copies to be filed at said first port of entry, and the others to be carried with the vessel, and one to be filed at each succeeding port of entry.

Sec. 9. As required by Sec. 112 of "The Customs Act," the fee to be exacted from all vessels navigating inland waters, when entering or clearing at any Port above Montreal, shall be fifty cents for each report inwards, or clearance outwards, irrespective of the tonnage of the vessel, and that such fees shall be exacted from all vessels so entering or clearing, except vessels holding coasting licenses, and that all orders or regulations inconsistent herewith shall be rescinded.

Sec. 10. For any violation of the requirements of these rules the master or owner of any such vessel shall be subject to a fine of $400, or such other fine or penalty provided by the said Act as may be applicable to the case, and the vessel may be detained until such fine or penalty is paid.

Sec. 11. Vessels fitted for and engaged in the deep sea fisheries are not included in these rules.

SYNOPSIS OF LAWS REGULATING THE COASTING TRADE.

Vessels of twenty tons net and upward are enrolled and licensed; if less than twenty tons net are licensed only.

License of a vessel is granted for One Year, and must be surrendered within three days after its expiration or on her subsequent return from sea, even though she be laid up, or be in another than the home district. Change in ownership, district, hail, rig, tonnage, dimensions, employment or managing owner; or the destruction, loss, abandonment, or disuse of a vessel, necessitates the surrender of marine documents, or report of their loss. Home papers can be obtained for a vessel through the custom-house where she may be.

The person in charge of a vessel is required to exhibit his papers when demanded by an officer of the revenue.

Officers of vessels, ordinarily, must be citizens.

Forging or altering license, or making use of a license granted to another vessel, or engaging in trade other than that specified in the license, subjects the vessel to forfeiture.

Temporary registers, enrollments, and licenses issued to vessels when absent from home port, should be delivered to the Collector within ten days after arrival within the home district.

The net tonnage of every documented vessel of the United States, and official number awarded, must be carved or otherwise permanently marked on the main beam.

The name of every documented vessel of the United States must be marked upon each bow and upon the stern, and the home port must also be marked upon the stern. These names must be painted or carved and guilded, in Roman letters in a light color on a dark ground, or in a dark color on a light ground, and be distinctly visible. The smallest letters used must not be less in size than four inches.

Steamers must also have the name on each outer side of the pilot-house, and (in case the vessel has side-wheels) on the outer side of each wheel-house, in letters not less than six inches in length. Steam vessels navigating must have inspection certificate.

The names of yachts and of their hailing ports must appear on some conspicuous part of their hulls. Names of vessels can be changed only as provided for by law.

The draught of every registered vessel shall be marked upon the stem and stern post, in English feet or decimeters, in either Arabic or Roman numerals. The bottom of each numeral shall indicate the draught to that line.

Every change of Master must be reported at the first port, and indorsed on the marine document.

Any accident, collision, or casualty causing loss of life or injury to person or property must be reported within five days.

The Atlantic seacoast is divided into three Great Coasting Districts: The first extends from the eastern boundary of the United States to the southern boundry of Georgia. The second from the river Perido, the eastern boundry of Alabama, to the Rio Grande. The third comprises the coast of the state of Florida.

Licensed vessels under twenty tons, in ballast, or laden wholly with American goods, or with distilled spirits, or foreign goods, in packages as imported not exceeding four hundred dollars in value, or foreign goods the aggregate value of which does not exceed eight hundred dollars, may trade from a customs district in one State to a customs district in the same or an adjoining State, and a vessel of twenty tons burden or more, so laden may trade from one customs district to another in the same Great District, or from a State in one Great District to an adjoining State in another Great District, without entering or clearing, but such vessels must be provided with manifest.

Registered vessels, whether laden or in ballast, are required to clear and enter in every district, unless from one district to another in the same or an adjoining State on the seacoast, and not laden with distilled spirits or foreign goods, the aggregate value of which exceeds eight hundred dollars, and in every case, if register shows rebate of duties allowed.

All vessels engaged in the coasting trade must enter and clear except under the above circumstances.

Registers should be deposited in the custom-house and obtained before clearance.

Vessels with merchandise arriving at any port and remaining twenty-four hours, must report to the proper officer of the customs.

Before a vessel can obtain enrollment and license for the coasting trade, cargo brought from a foreign country must be discharged, and indorsements of rebates of duties canceled.

Boats and lighters not masted, or if masted, not decked, employed in a harbor exclusively; boats under five tons in burden; canal boats, without propelling apparatus of their own, while employed in voyages wholly or partly on the canals or other internal waters of a State, and not carrying passengers; and flat boats, barges, and like craft, not propelled by internal motive power of their own, on the rivers or lakes of the United States, are exempt from the navigation laws above mentioned. Other vessels employed without marine papers become subject to penalty, and penalties are incurred by violation of the navigation and inspection laws mentioned above.

VESSEL PAPERS.

According to a new ruling of the department of commerce and labor, which goes into effect on January 1, 1907, vessel enrollments and vessel licenses will be consolidated into one document by the customs authorities. At the present time all boats have two papers —enrollment and license.

Under the old law all masters who do not surrender the licenses for their boats within three days after expiration are fined $50, but this fine was generally remitted. Under the new act, however, a fine of $10 will be collected for every failure and this amount will not be refunded under any circumstances.

LAWS GOVERNING LIGHTS.

Revised Statutes.

Sec. 5358. * * * Every person who holds out or shows any false light, or extinguishes any true light, with intent to bring any vessel, sailing upon the sea, into danger or distress, or shipwreck, shall be punished by a fine of not more than five thousand dollars, and imprisonment at hard labor not more than ten years.

AN ACT to authorize additional aids to navigation in the Light-House Establishment.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, * * *

* * * * *

Sec. 3. That after the first day of January, nineteen hundred and seven, it shall be unlawful for any person, company, corporation, or municipality not under the control of the Light-House Board, to establish, erect, or maintain in the navigable waters of the United States any light as an aid to navigation, or any other aid to navigation similar to any of those maintained by the United States under the control and direction of the Light-House Board, without first obtaining permission so to do from the Light-House Board, in accordance with rules and regulations to be established by the Secretary of Commerce and Labor; and any person violating the provisions of this section or any rules and regulations established by the Secretary of Commerce and Labor in accordance herewith shall be deemed guilty of a misdemeanor and be subject to a fine not exceeding the sum of one hundred dollars for each offense, and each day during which such violation shall continue shall be considered as a new offense.

Approved, June 20, 1906.

LAWS FOR THE PROTECTION OF AIDS TO NAVIGATION.

United States.

AN ACT making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums of money be, and are hereby, appropriated, to be paid out of any money in the Treasury not otherwise appropriated, to be immediately available, and to be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers, for the construction, completion, repair, and preservation of the public works hereinafter named:

* * * * *

Sec. 14. That it shall not be lawful for any person or persons to take possession of or make use of for any purpose, or build upon, alter, deface, destroy, move, injure, obstruct by fastening vessels thereto or otherwise, or in any manner whatever impair the usefulness of any sea wall, bulkhead, jetty, dyke, levee, wharf, pier, or other work built by the United States, or any piece of plant, floating or otherwise, used in the construction of such work under the control of the United States, in whole or in part, for the preservation and improvement of any of its navigable waters or to prevent floods, or as boundary marks, tide guages, surveying stations, buoys, or other established marks, nor remove for ballast or other purposes any stone or other material composing such works: Provided, That the Secretary of War may, on the recommendation of the Chief of Engineers, grant permission for the temporary occupation or use of any of the aforementioned public works when in his judgment such occupation or use will not be injurious to the public interest.

Sec. 15. That it shall not be lawful to tie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft; or to voluntarily or carelessly sink, or permit or cause to be sunk, vessels or other craft in navigable channels; or to float loose timbers and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such manner as to obstruct, impede, or endanger navigation. And whenever a vessel, raft, or other craft is wrecked and sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or beacon during the day and a lighted lantern at night, and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or failure of the said owner so to do shall be unlawful; and it shall be the duty of the owner of such sunken craft to commence the immediate removal of the same, and prosecute such removal diligently, and failure to do so shall be considered as an abandonment of such craft, and subject the same to removal by the United States as hereinafter provided for.

Sec. 16. That every person and every corporation that shall violate, or that shall knowingly aid, abet, authorize, or instigate a violation of the provisions of sections * * * fourteen, and fifteen of this Act shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding twenty-five hundred dollars nor less than five hundred dollars, or by imprisonment (in the case of a natural person) for not less than thirty days nor more than one year, or by both such fine and imprisonment, in the discretion of the court, one-half of said fine to be paid to the person or persons giving information which shall lead to conviction. And any and every master, pilot, and engineer, or person or persons acting in such capacity, respectively, on board of any boat or vessel * * * who shall willfully injure or destroy any work of the United States contemplated in section fourteen of this Act, or who shall willfully obstruct the channel of any waterway in the manner contemplated in section fifteen of this Act, shall be deemed guilty of a violation of this Act, and shall upon conviction be punished as hereinbefore provided in this section, and shall also have his license revoked or suspended for a term to be fixed by the judge before whom tried and convicted. And any boat, vessel, scow, raft, or other craft used or employed in violating any of the provisions of sections * * * fourteen, and fifteen of this Act shall be liable for the pecuniary penalties specified in this section, and in addition thereto for the amount of the damages done by said boat, vessel, scow, raft, or other craft, which latter sum shall be placed to the credit of the appropriation for the improvement of the harbor or waterway in which the damage occurred, and said boat, vessel, scow, raft, or other craft may be proceeded against summarily by way of libel in any district court of the United States having jurisdiction thereof.

Sec. 17. That the Department of Justice shall conduct the legal proceedings necessary to enforce the foregoing provisions of sections nine to sixteen, inclusive, of this Act; and it shall be the duty of district attorneys of the United States to vigorously prosecute all offenders against the same whenever requested to do so the Secretary of War or by any of the officials hereinafter designated, and it shall furthermore be the duty of said district attorneys to report to the Attorney-General of the United States the action taken by him against offenders so reported, and a transcript of such reports shall be transmitted to the Secretary of War by the Attorney-General; and for the better enforcement of the said provisions and to facilitate the detection and bringing to punishment of such offenders, the officers and agents of the United States in charge of river and harbor improvements, and the assistant engineers and inspectors employed under them by authority of the Secretary of War, and the United States collectors of customs and other revenue officers, shall have power and authority to swear out process and to arrest and take into custody, with or without process, any person or persons who may commit any of the acts or offenses prohibited by the aforesaid sections of this Act, or who may violate any of the provisions of the same: Provided, That no person shall be arrested without process for any offense not committed in the presence of some one of the aforesaid officials: And provided further, That whenever any arrest is made under the provisions of this Act, the person so arrested shall be brought forthwith before a commissioner, judge, or court of the United States for examination of the offenses alleged against him; and such commissioner, judge, or court shall proceed in respect thereto as authorized by law in case of crimes against the United States.

* * * * *

That all laws or parts of laws inconsistent with the foregoing sections nine to twenty, inclusive, of this Act are hereby repealed: Provided, That no action begun, or right of action accrued, prior to the passage of this Act shall be affected by this repeal: Provided further, That nothing contained in the said foregoing sections shall be construed as repealing, modifying, or in any manner affecting the provisions of an act of Congress approved June twenty-ninth, eighteen hundred and eighty-eight, entitled "An Act to prevent obstructive and injurious deposits within the harbor and adjacent waters of New York City, by dumping or otherwise, and to punish and prevent such offenses," as amended by section three of the river and harbor Act of August eighteenth, eighteen hundred and ninety four, (As amended by Act approved June 13, 1902.)

* * * * *

Approved, March 3, 1899.

AN ACT relating to the anchorage and movements of vessels in St. Mary's River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and he hereby is, authorized and directed to adopt and prescribe suitable rules and regulations governing the movements and anchorage of vessels and rafts in Saint Mary's River, from Point Iroquois, on Lake Superior, to Point Detour, on Lake Huron, and for the purpose of enforcing the observance of such regulations the said Secretary is hereby authorized to detail one or more revenue cutters for duty on said river.

Sec. 2. That all officers of the Revenue-Cutter Service who are directed to enforce the regulations prescribed by the above rules are hereby empowered and directed, in case of necessity, or when a proper notice has been disregarded, to use the force at their command to remove from channels or stop any vessels found violating the prescribed rules.

Sec. 3. That in the event of the violation of any such regulations or rules of the Secretary of the Treasury by the owners, master, or person in charge of such vessel, such owners, master, or person in charge shall be liable to a penalty of two hundred dollars, and the vessel, its tackle, apparel, furniture, and cargo, at any time used or employed in violation of such regulations, shall be forfeited to the United States: Provided, That the Secretary of the Treasury may remit said fine or release said vessel on such terms as he may prescribe: Provided also, That nothing in this Act shall be construed to amend or repeal the Act entitled "An Act to regulate navigation on the Great Lakes and connecting tributary waters as far east as Montreal."

Approved, March 6, 1896.

NEW YORK.

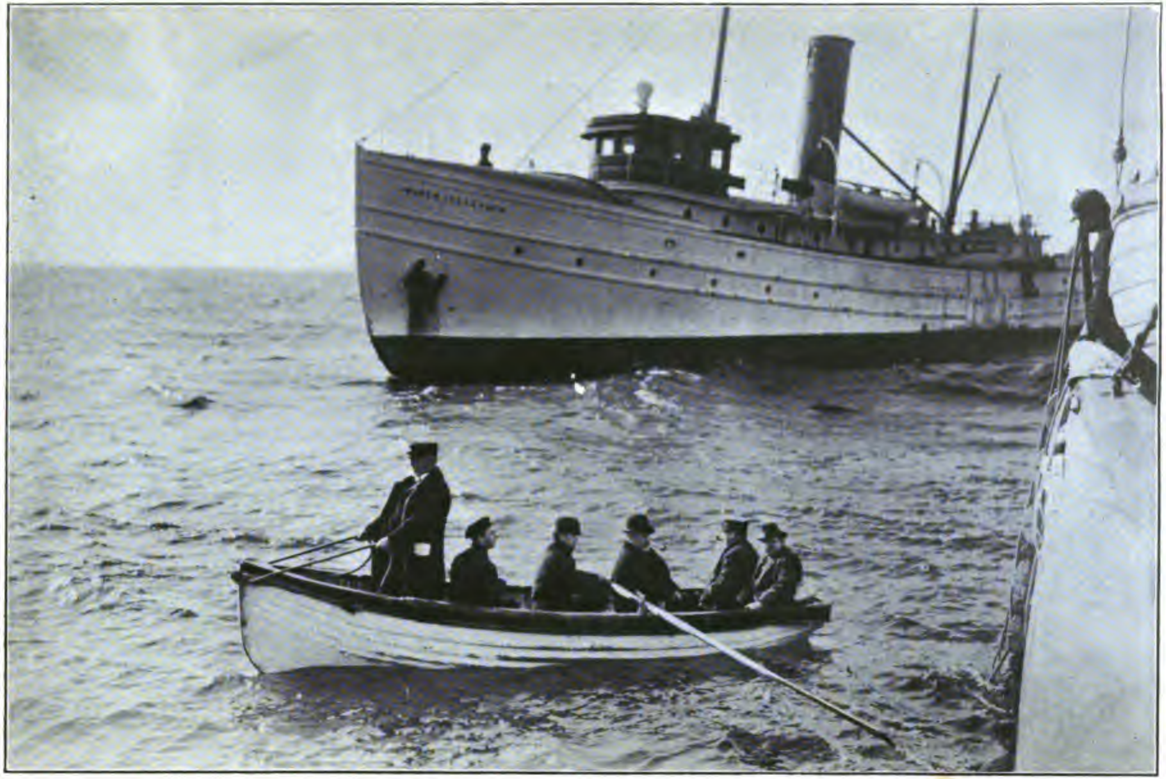
AN ACT to protect the buoys moored in the Niagara River.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Any person mooring any vessel, scow, or raft to any buoy placed by the United States in the Niagara River, or who shall in any manner make fast thereto any vessel, scow, or raft, shall be liable to a penalty of fifty dollars for each and every offence.

Sec. 2. Any person who shall remove or destroy any such buoy, by accident or otherwise, and shall not report such removal or accident to the collector of the port next entered after such removal or destruction, shall be liable to a penalty of one hundred dolars for each and every offence.

Sec. 3. Said penalties may be recovered by complaint before any court competent to try the same.



PUTTING A NEW YORK PILOT ON BOARD

Sec. 4. In case penalties shall be collected for violation of this act, one-half shall be paid to the informer; the remainder of said penalties shall be paid to the collector of the port of Buffalo, to be used in maintaining and restoring said buoys.

Sec. 5. The collector of the port of Buffalo is hereby authorized to sue for and collect the penalties mentioned in this act.

Sec. 6. This act shall take effect immediately.

Passed April 4, 1871.

PENNSYLVANIA.

An Act for the protection of the aids to navigation established by the authority of the United States Light-House Board within the State of Pennsylvania.

Be it enacted by the General Assembly of the State of Pennsylvania, as follows:

Section 1. That any person or persons who shall moor any vessel or vessels of any kind or name whatsoever, or any raft, or any part of a raft, to any buoy, beacon, or day-mark, placed in the waters of Pennsylvania by the authority of the United States Light-House Board, or shall in any manner hang on with any vessel, or raft, or part of a raft, to any such buoy, beacon, or day-mark, or shall wilfully remove, damage, or destroy any such buoy, beacon, or day-mark, or shall cut down, remove, damage, or destroy any beacon or beacons erected on land in this State by the authority of the said United States Light-House Board, or having, through unavoidable accident, run down, dragged from its position, or in any way injured any buoy, beacon, or day-mark, as aforesaid, and shall fail to give notice, as soon as practicable, of having done so, to the Light-House Inspector of the district in which said buoy, beacon, or day-mark may be located, or to the board of wardens for the port of Philadelphia, shall, for every such offense, be deemed guilty of a misdemeanor, and, upon conviction thereof, before any court of competent jurisdiction, shall be punished by a fine not to exceed two hundred dollars, or by imprisonment not to exceed three months, or both, at the discretion of the court; one-third of the fine in each case shall be paid to the informer and two-thirds thereof to the Light-House Board, to be used in repairing the said buoys or beacons.

Sec. 2. It shall be unlawful for any vessel to anchor on the range-line of any range-lights established by the United States Light-House

Board in this State, and the master of any vessel so anchoring shall be deemed guilty of a misdemeanor, and, upon conviction thereof, before any court of competent jurisdiction, shall be punished by a fine not to exceed fifty dollars, one-half the fine in each case to be paid to the informer and one-half to the State.

Sec. 3. The cost of repairing or replacing any such buoy, beacon, or day-mark, which may have been misplaced, damaged, or destroyed by any vessel or raft whatsoever, having been made fast to any such buoy or beacon, or day-mark, shall, when the same shall be legally ascertained, be a lien upon such vessel or raft, and may be recovered against said vessel or raft, and the owner or owners thereof, in an action of debt in any court of competent jurisdiction in this State.

Sec. 4. This act shall take effect immediately.

Approved, May 13, 1879.

MICHIGAN.

An Act for the protection of buoys and beacons.

Section 1. The people of the State of Michigan enact, That any person mooring any vessel to any of the buoys or beacons placed in any of the waters of the State by the authority of the United States Light-House Board, or in any manner hanging on with a boat or vessel to any such buoy or beacon, shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be punishable by a fine not exceeding fifty dollars and imprisonment in the county jail not exceeding thirty days; and any person who shall wilfully remove or destroy any such buoy or beacon shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be punishable by a fine not exceeding two hundred and fifty dollars, nor less than fifty dollars, and imprisonment in the county jail not exceeding ninety days.

Sec. 2. It shall be the duty of the prosecuting attorney of the county in which such buoy or beacon shall be situated to proceed, in the name of the people, against any person violating the preceding section of this act, when notified in writing of such violation by any officer of the United States Light-House Service.

Approved, January 30, 1869.

MINNESOTA.

An Act to protect Government lights and light-house stations on the navigable waters of this State.

Be it enacted by the Legislature of the State of Minnesota, as follows:

Section 1. Every person who shall willfuly break, injure, deface, or destroy any light-house station, post, platform, steps, lamp or other structure pertaining to such light-house station, or shall extinguish any light erected by the United States upon or along the navigable waters of this State to aid in the navigation thereof (if such offense be not punishable by the laws of the United States,) shall, upon conviction, be adjudged guilty of a misdemeanor and punished by imprisonment in the county jail not exceeding one year, or by fine not exceeding $100, or by both such fine and imprisonment.

Sec. 2. Every person who shall willfully break, injure, deface, or destroy any light-house station, post, platform, steps, lamp, or other structure pertaining to such light-house station, the same being the property of the United States, or shall extinguish any light erected by the United States upon or along any of the navigable waters of this State to aid in the navigation thereof, with intent to endanger the safety of any vessel or vessels navigating said waters, or to jeopardize the safety of any person or persons or property in or upon said vessel of vessels, shall (if such offense be not punishable by the laws of the United States), on conviction, be adjudged guilty of a felony and be punishable by imprisonment in the penitentiary for a term not exceeding five years.

Sec. 3. Every person or persons who shall moor any vessel or vessels of any kind or name whatsoever, or any boat, skiff, barge, scow, raft, or part of a raft to any buoy or beacon placed in the navigable waters of the State, or in any bay, river, or arm of the sea bordering upon this State, by authority of the United States Light-House Board, or shall in any manner hang on with any vessel, boat, skiff, barge, scow, raft, or part of a raft to any buoy or beacon, or shall cut down, remove, damage or destroy any beacon or beacons erected on land in this State by the authority of the said United States Light-House Board, shall for every offense be deemed guilty of a misdemeanor, and, upon conviction thereof, before any court of competent jurisdiction, shall be punished by a fine of not less than $100 nor more than $200, or by imprisonment in the county jail not less than one nor more than six months, or by both such fine and imprisonment, in the discretion of the court.

Sec. 4. That one-half of all fines under this act shall be paid by the court to the informer and that the other half shall be paid into the common school fund of the county in which the action shall be tried.

Sec. 5. This act shall take effect and be in force from and after its passage.

ARE YOU POSTED ON THE RULES AND REGULATIONS FOR THE GOVERNMENT OF NAVIGATION IN THE HARBORS AND CHANNELS OF LAKE PORTS ?

It is important to know that, in the main points, the rules and regulations for the navigation of different channels, etc., on the lakes are very much alike. Therefore a perfect knowledge of these main points will serve to keep a pilot out of trouble, and will answer the purpose as well as memorizing whole pages of 'Rules and Regulations' prescribed by the Secretary of War. A list of these main points is given below.

The movement of all boats shall be under the direction of the official in charge of such harbor or channel.

Making fast to Government entrance piers, revetments, elevated trestles, etc., is not allowed.

All such channels, harbors, canals, etc., have a speed regulation.

Not lawful to dump ashes, dirt or sinkable rubbish of any kind in any of these channels, harbors or canals.

Vessels shall anchor only within the limits specified by the rules of the harbor.

Unlawful to wilfully or carelessly obstruct, in any way, the free navigation of such channels, harbors, canals, etc.

Vessels cannot tie up to any Government wharf or pier without permission being granted by the officer in charge.

One vessel cannot pass another, going the same direction, in any such channels, canals, etc.

Vessels cannot enter such channels, canals, etc., two or more abreast.

Vessels cannot delay, by slow passage, the progress of other vessels.

Vessels must not attempt to enter any such channel, canal, etc., whose actual draft exceeds the least draft as given for such channel.

Unlawful for steamers to blow their whistles while in the draws of the bridges in any of the big lake cities.

Sailing vessels not allowed to beat through any such channel, canals, etc.

Steamers towing vessels in Sandusky or Toledo channels cannot have a towline more than 200 feet in length.

Steamers must not blow flues while in any of the canals at the Soo.

The following lake ports, canals, channels, harbors of refuge, etc., have rules and regulations to govern the navigation of them.

LAKE ERIE.

Buffalo.
Conneaut.
Ashtabula.
Fairport.
Cleveland.
Lorain.
Huron.
Sandusky.
Toledo.

LAKE HURON.

Harbor Beach.
Cheboygan.

LAKE MICHIGAN.

Petoskey.
Charlevoix.
Frankfort.
Portage Lake.
Manistee.
Ludington.
Pentwater.
White Lake.
Muskegon.
Grand Haven.
Holland.
Saugatuck.
South Haven.
St. Joseph.
Michigan City.
South Chicago.
Chicago.
Waukegan.
Kenosha.
Racine.
Milwaukee.
Port Washington.
Sheboygan.
Manitowoc.
Two Rivers.
Kewaunee.
Ahnapee.
  (Algoma Harbor)
Sturgeon Bay Canal.
Menominee.

LAKE SUPERIOR.

Portage Lake Ship Canal.
Duluth.
Superior.

LAKE ONTARIO.

Charlotte.
Toronto.
Welland Canal.

IN RIVERS.

Soo River and Canal.
St. Clair Flats Canal.

A FEW RULINGS THAT SHOULD BE BETTER UNDERSTOOD.

Accidents aboard steamers must be reported to the nearest board of Local Inspectors and also to the Collector of Customs of the district to which such vessel belongs. The report to the Local Inspectors must be made at once, the report to the Customs Collector must be made within 5 days.

Accidents aboard barges or sailing vessels do not have to be reported to the Local Inspectors.

Local Inspectors have to be notified when a steamer goes into dry-dock.

PILOT RULES FOR THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL.

(Adopted by the Board of Supervising Inspectors, January, 1902, and approved by the Secretary of Commerce and Labor, March, 17, 1904. Authorized by act of Congress, approved February 8, 1895.)

All the rules relating to steam vessels in passing each other contained in the Pilot Rules for the Great Lakes and their connecting and tributary waters as far east as Montreal shall also apply to all vessels propelled by gas, fluid, naphtha, or electric motors, and between any of such vessels and steam vessels, navigating these waters.

Rule I. When steamers are approaching each other "head and head," or nearly so, it shall be the duty of each steamer to pass to the right, or port side of the other; and the pilot of either steamer may be first in determining to pursue this course, and thereupon shall give, as a signal of his intention, one short and distinct blast of his whistle, which the pilot of the other steamer shall answer promptly by a similar blast of his whistle, and thereupon such steamers shall pass to the right or port side of each other. But if the course of such steamers is so far on the starboard of each other as not to be considered by pilots as meeting "head and head," or nearly so, the pilot so first deciding shall immediately give two short and distinct blasts of his whistle, which the pilot of the other steamer shall answer promptly by two similar blasts of his whistle, and they shall pass to the left, or on the starboard side of each other.

Provided, however, that in all narrow channels where there is a current and in the rivers Saint Mary, Saint Clair, Detroit, Niagara, and Saint Lawrence, when two steamers are meeting, the descending steamer shall have the right of way, and shall, before the vessels shall have arrived within the distance of one-half mile of each other, give the signal necessary to indicate which side she elects to take.

Note.—In the night, steamers will be considered as meeting "head and head" so long as both the colored lights of each are in view of the other.

Rule II. When steamers are approaching each other in an oblique direction, as shown in the diagram of fourth and fifth situations, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other, which latter vessel shall keep her course and speed. The steam vessel having the other on her starboard side indicates by one blast of her whistle her intention to direct her course to starboard, and two blasts if directing her course to port, to which the other shall promptly respond; but the giving and answering signals by a vessel required to keep her course shall not vary the duties and obligations of the respective vessels.

Rule III. If, when steamers are approaching each other, the pilot of either vessel fails to understand the course or intention of the other, whether from signals being given or answered erroneously, or from other causes, the pilot so in doubt shall immediately signify the same by giving several (five or more) short and rapid blasts of the whistle; and if the vessels shall have approached within half a mile of each other, both shall be immediately slowed to a speed barely sufficient for steerageway until the proper signals are given, answered, and understood, or until the vessels shall have passed each other.

Vessels approaching each other from opposite directions are forbidden to use what has become technically known among pilots as "cross signals"—that is, answering one whistle with two, and answering two whistles with one. In all cases and under all circumstances, a pilot receiving either of the whistle signals provided in the rules, which for any reason he deems injudicious to comply with, instead of answering it with a cross signal, must at once observe the provisions of this rule.

Rule IV. Whenever a steamer is nearing a short bend or curve in the channel, where, from the height of the banks or other cause, a steamer approaching from the opposite direction cannot be seen for a distance of half a mile, the pilot of such steamer, when he shall have arrived within half a mile of such curve or bend, shall give a signal by one long blast of the whistle, which signal shall be answered by a similar blast, given by the pilot of any approaching steamer that may be within hearing. Should such signal be so answered by a steamer upon the farther side of such bend, then the usual signals for meeting and passing shall immediately be given and answered; but if the first alarm signal of such pilot be not answered, he is to consider the channel clear and govern himself accordingly.

When boats are moved from their docks or berths, and other boats are liable to pass from any direction toward them, they shall give the same signal as in case of boats meeting at a bend; but immediately after clearing the berths so as to be fully in sight they shall be governed by Rule I.

Rule V. The signals, by the blowing of the whistle, shall be given and answered by pilots, in compliance with these rules, not only when meeting "head and head," or nearly so, but at all times when passing or meeting at a distance within a half mile of each other, and whether passing to the starboard or port.

Rule VI. When steamers are running in the same direction, and the pilot of a steamer which is astern shall desire to pass on the right or starboard hand of the steamer ahead, he shall give one short blast of the whistle, as asignal of such desire and intention, and shall put his helm to port; or if he shall desire to pass on the left or port side of the steamer ahead, he shallgive two short blasts of the whistle as a signal of such desire and intention, and shall put his helm to star board, and the pilot of the steamer ahead shall answer by the same signals; or of he does not think it safe for the steamer astern to attempt to pass at that point, he shall immediately signify the same by giving several short and rapid blasts of the whistle, and under no circumstances shall the steamer astern attempt to pass the steamer ahead until such time as they have reached a point where it can be safely done, when said steamer ahead shall signify her willingness by blowing the proper signals. The boat ahead shall in no case attempt to cross the bow or crowd upon the course of the passing steamer.

Every vessel coming up with another vessel from any direction more than two points abaft her beam—that is, in such a position, with reference to the vessel which she is overtaking, that at night she would be unable to see either of that vessel's side lights—shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

N. B.—In construing and obeying these rules, due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case, rendering a departure from them necessary in order to avoid immediate danger.

Rule VII. All double-end ferryboats on the Great Lakes and tributaries thereto shall carry a central range of clear, bright, white lights, showing all around the horizon, placed at equal altitudes forward and aft; also such side lights as specified in rule 3, paragraphs (b) and (c), act of Congress approved February 8, 1895, regulating navigation on the Great Lakes.

Local inspectors in districts having ferryboats shall, whenever the safety of navigation may require, designate for each line of such boats a certain light, white or colored, which shall show all around the horizon, to designate and distinguish such lines from each other, which light shall be carried on a flagstaff amidship, 15 feet above the white range light.

Rule VIII. When steamers are running in a fog or thick weather, except steamers with a raft in tow, it shall be the duty of the pilot to cause three distinct blasts of the whistle to be sounded at intervals not exceeding one minute. A steamer with a raft in tow shall sound at intervals of not more than one minute a screeching or Modoc whistle for from three to five seconds.

A steam vessel hearing, apparently not more than four points from right ahead, the fog signal of another vessel shall at once reduce her speed to bare steerageway, and navigate with caution until the vessels shall have passed each other.

Rule IX. Tugs under 30 tons register (net) and small steamers navigating the St. Lawrence River, except open boats, shall carry the red and green lights prescribed by law for other lake steamers; and, in addition thereto, a central range of two white lights, the after light being carried at an elevation of at least 15 feet above the light at the head of the vessel; and, when towing other vessels, shall carry an additional white light aft not less than 3 feet vertically below the after range light.

Except as provided for in the preceding paragraph of this rule, steam tugs under 30 tons register (net), whose principal business is harbor towing, shall carry the red and green side lights carried by other steamers; and, at the foremast head, or, if the steamer have no foremast, then on top of the pilot house, a white light so constructed as to show a uniform and unbroken light over an arc of the horizon of 20 points of the compass, and so fixed as to throw the light 10 points on each side of the vessel, namely, from right ahead to 2 points abaft the beam on either side, and of such a character as to be visible at a distance of at least 3 miles; and when towing, except when towing a raft, shall carry an additional white light hung not less than 3 feet vertically above the foremast headlight. When towing a raft, the two headlights shall be hung horizontally not less than 4 feet apart.

Open boats on the Great Lakes and their tributaries east as far as Montreal shall not be obliged to carry the side lights required for other vessels, but shall, if they do not carry such lights, carry a lantern having a green slide on one side and a red slide on the other side; and on the approach of or to other vessels, such lantern shall be exhibited in sufficient time to prevent collision, and in such a manner that the green light shall not be seen on the port side, nor the red light on the starboard side.

Rule X. Barges, "barge consorts," or canal boats in tow of a steamer shall carry red and green side lights, which shall be placed in the same manner as required on other vessels being towed; and a "barge consort" not having her own anchor down, but hanging on a hawser astern of a towing steamer at anchor, shall carry, in addition to the red and green side lights, a red light at the foremast head and a red light at end of main peak, or in equivalent positions at bow and stern.

All scows without rudders or other means of guidance being towed by hawser behind steam vessels on any navigable waters of the United States shall carry a regulation white light at each end of each scow (such lights to be carried not less than 6 feet above the deck), as shown in diagrams No. 4, Department Circular No. 27, dated February 13, 1894. When scows are towed two or more abreast, they shall carry the regulation white lights as shown in diagrams No. 7, Department Circular No. 27, 1894.

Rule XI. Produce boats, canal boats, fishing boats, rafts, or other water craft navigating any bay, harbor, or river, by hand power, horse power, sail, or by the current of the river, or which shall be anchored or moored in or near the channel or fairway of any bay, harbor, or river, and not otherwise provided for, shall carry one bright white light forward, not less than 6 feet above the deck.

Rafts shall carry, in each case, on a pole not less than 6 feet high, a bright white light, visible all around the horizon, as follows:

Rafts of one crib and not more than two in length shall carry one such light. Rafts of three or more cribs in length shall carry one such light at each end of the raft. Rafts of more than one crib abreast shall carry one such light on each outside corner of the raft, making four lights in all.

Bag or boom rafts navigating or anchored in the fairway of any bay, harbor, or river, shall carry a bright white light at least 12 feet high at each end of the raft, and one of such lights on each side midway between the forward and after end.

The Board of Supervising Inspectors, at their annual meeting of January, 1900, adopted the following resolution relating to the use of search lights:

Resolved: That masters, mates, and pilots of all vessels be required to exercise due caution in the use of their search lights so as not to throw the rays of the light into the pilot house of passing steamers.

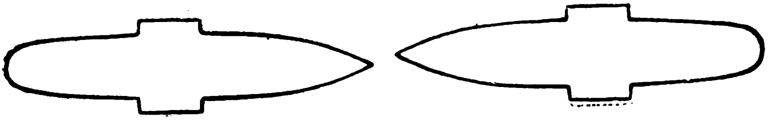
◆

DIAGRAMS.

The following diagrams are intended to illustrate the working of the foregoing system of colored lights, and are to be used by pilots, in connection with the rules, as sailing directions on meeting or nearing other steamers:

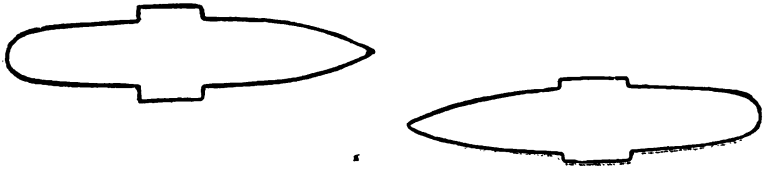
First Situation.

In this situation the two colored lights will be visible to the pilot of each steamer, which will indicate their direct approach "head and head" toward each other. In this situation it is a standing rule that both shall put their helms to port and pass to the right, each having previously given one blast of the whistle.



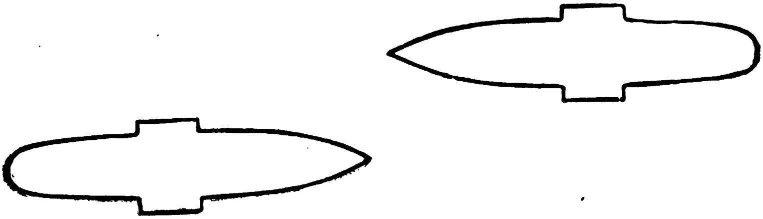
Second Situation.

In this situation the green light only will be visible to the pilot of each steamer. They are, therefore, passing to starboard, which is rulable in this situation, each pilot having previously signified his intention by two blasts of the whistle.



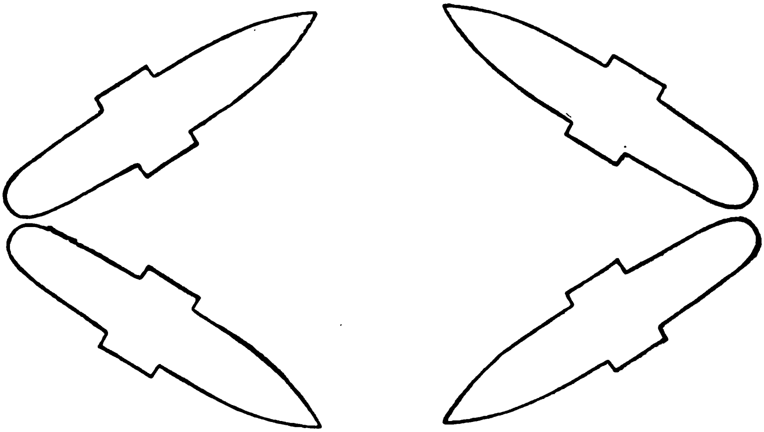
Third Situation.

In this situation the red light only will be visible to the pilot of each steamer. Both vessels are evidently passing to port, which is rulable in this situation, each pilot having previously signified his intention by one blast of the whistle.



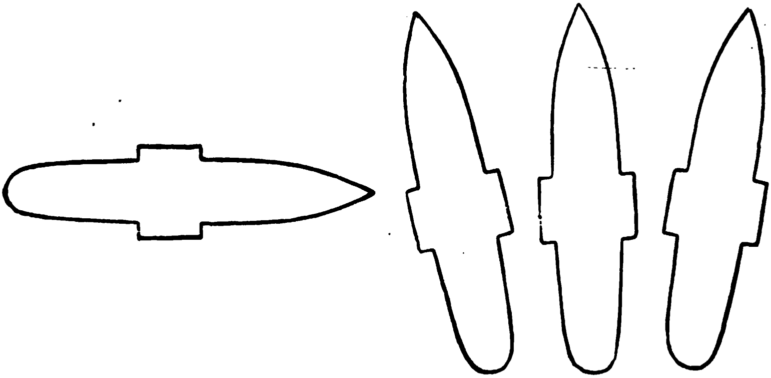
Fourth and Fifth Situations.

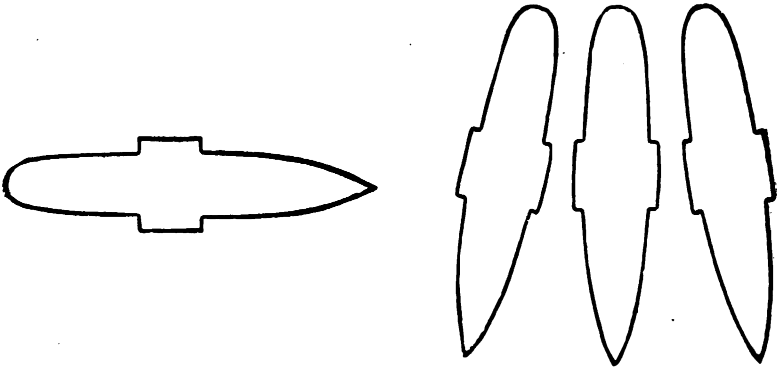
When steamers are approaching each other in an oblique direction, as indicated in the diagrams of the fourth and fifth situations, so that a continuation of their courses would involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other, and shall, if necessary to do so, slacken her speed, or stop and reverse; indicating her intention by either one or two blasts of the whistle, as the circumstances may require, and in accordance with Rule I of the Pilot Rules.



Sixth and Seventh Situations.

A steamer approaching another crossing her bow at or nearly at right angles, as represented in diagrams of the sixth and seventh situations, shall, if approaching the crossing steamer so near as to involve risk of collision, port her helm, when seeing only the red light of the crossing steamer; and starboard her helm if only the green light is in view; at the same time, slow, or stop and back, if necessary, each steamer to give the whistle signals as provided in Rule I of the rules, the crossing steamer to keep course and speed.





Note—The whistle signals of the above situations must be given in all cases, except as qualified by Rule III, Pilot Rules.

The manner of fixing the colored lights should be particularly attended to. They will require to be fitted each with a screen, of wood or canvas, on the inboard side and close to the light, in order to prevent both being seen at the same moment from any direction but that of right ahead to 2 points abaft the beam.

This is important, for without the screens any plan of bow lights would be ineffectual as a means of indicating the direction of steering. This will be readily understood by a reference to the preceding illustrations, where it will appear evident that in any situation in which two vessels may approach each other in the dark the colored lights will instantly indicate to both the relative course of each; that is, each will know whether the other is approaching directly, or crossing the bows either to starboard or port.

This intimation, with the signals by whistle, as provided, is all that is required to enable vessels to pass each other in the darkest night with almost equal safety as in broad day.

AN ACT To regulate navigation on the Great Lakes and their connecting and tributary waters.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following rules for preventing collisions shall be followed in the navigation of all public and private vessels of the United States upon the Great Lakes and their connecting and tributary waters as far east as Montreal.

Steam and Sail Vessels.

Rule 1. Every steam vessel which is under sail and not under steam shall be considered a sail vessel; and every steam vessel which is under steam, whether under sail or not, shall be considered a steam vessel. The words steam vessel shall include any vessel propelled by machinery. A vessel is under way within the meaning of these rules when she is not at anchor or made fast to the shore or aground.

Lights.

Rule 2. The lights mentioned in the following rules and no others shall be carried in all weathers from sunset to sunrise. The word visible in these rules when applied to lights shall mean visible on a dark night with a clear atmosphere.

Rule 3. Except in the cases hereinafter expressly provided for, a steam vessel when under way shall carry:

(a) On or in front of the foremast, or if a vessel without a foremast, then on the forepart of the vessel, at a height above the hull of not less than twenty feet, and if the beam of the vessel exceeds twenty feet, then at a height above the hull not less than such beam, so, however, that such height need not exceed forty feet, a bright white light so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such character as to be visible at a distance of at least five miles.

(b) On the starboard side, a green light, so constructed as to throw an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side, a red light, so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such character as to be visible at a distance of at least two miles.

(d) The said green and red lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(e) A steamer of over one hundred and fifty feet register length shall also carry when under way an additional bright light similar in construction to that mentioned in subdivision (a), so fixed as to throw the light all around the horizon and of such character as to be visible at a distance of at least three miles. Such additional light shall be placed in line with the keel at least fifteen feet higher from the deck and more than seventy-five feet abaft the light mentioned in subdivision (a).

Vessels Towing.

Rule 4. A steam vessel having a tow other than a raft shall in addition to the forward bright light mentioned in subdivision (a) of rule three carry in a vertical line not less than six feet above or below that light a second bright light of the same construction and character and fixed and carried in the same manner as the forward bright light mentioned in said subdivision (a) of rule three. Such steamer shall also carry a small bright light abaft the funnel or after mast for the tow to steer by, but such light shall not be visible forward of the beam.

ONE OF THE CRACK SHIPS OF FIFTY YEARS AGO

Rule 5. A steam vessel having a raft in tow shall, instead of the forward lights mentioned in rule four, carry on or in front of the foremast, or if a vessel without a foremast then in the fore part of the vessel, at a height above the hull of not less than twenty feet, and if the beam of the vessel exceeds twenty feet, then at a height above the hull not less than such beam, so however that such height need not exceed forty feet, two bright lights in a horizontal line athwartships and not less than eight feet apart, each so fixed as to throw the light all around the horizon and of such character as to be visible at a distance of at least five miles. Such steamer shall also carry the small bright steering light aft, of the character and fixed as required in rule four.

Rule 6. A sailing vessel under way and any vessel being towed shall carry the side lights mentioned in rule three.

A vessel in tow shall also carry a small bright light aft, but such light shall not be visible forward of the beam.

Rule 7. The lights for tugs under thirty tons register whose principal business is harbor towing, and for boats navigating only on River Saint Lawrence, also ferryboats, rafts, and canal boats, shall be regulated by rules which have been or may hereafter be prescribed by the Board of Supervising Inspectors of Steam Vessels.

Rule 8. Whenever, as in the case of small vessels under way during bad weather, the green and red side lights cannot be fixed, these lights shall be kept at hand lighted and ready for use, and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy, they shall each be painted outside with the color of the light they respectively contain, and shall be provided with suitable screens.

Rule 9. A vessel under one hundred and fifty feet register length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding twenty feet above the hull, a white light in a lantern constructed so as to show a clear, uniform, and unbroken light, visible all around the horizon at a distance of at least one mile.

A vessel of one hundred and fifty feet or upward in register length, when at anchor, shall carry in the forward part of the vessel, at a height of not less than twenty and not exceeding forty feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall be not less than fifteen feet lower than the forward light, another such light.

Rule 10. Produce boats, canal boats, fishing boats, rafts, or other water craft navigating any bay, harbor, or river by hand power, horse power, sail, or by the current of the river, or which shall be anchored or moored in or near the channel or fairway of any bay, harbor, or river, and not otherwise provided for in these rules, shall carry one or more good white lights, which shall be placed in such a manner as shall be prescribed by the Board of Supervising Inspectors of Steam Vessels.

Rule 11. Open boats shall not be obliged to carry the side lights required for other vessels, but shall, if they no not carry such lights, carry a lantern having a green slide on one side and a red slide on the other side; and on the approach of or to other vessels such lantern shall be exhibited in sufficient time to prevent collision, and in such a manner that the green light shall not be seen on the port side, nor the red light on the starboard side. Open boats, when at anchor or stationary, shall exhibit a bright white light. They shall not, however, be prevented from using a flare-up in addition if considered expedient.

Rule 12. Sailing vessels shall at all times, on the approach of any steamer during the nighttime, show a lighted torch upon that point or quarter to which such steamer shall be approaching.

Rule 13. The exhibition of any light on board of a vessel of war or revenue cutter of the United States may be suspended whenever, in the opinion of the Secretary of the Navy, the commander in chief of a squadron, or the commander of a vessel acting singly, the special character of the service may require it.

Fog Signals.

Rule 14. A steam vessel shall be provided with an efficient whistle, sounded by steam or by some substitute for steam, placed before the funnel not less than eight feet from the deck, or in such other place as the local inspectors of steam vessels shall determine, and of such character as to be heard in ordinary weather at a distance of at least two miles, and with an efficient bell, and it is hereby made the duty of the United States local inspectors of steam vessels when inspecting the same to require each steamer to be furnished with such whistle and bell. A sailing vessel shall be provided with an efficient fog horn and with an efficient bell.

Whenever there is thick weather by reason of fog, mist, falling snow, heavy rainstorms, or other causes, whether by day or by night, fog signals shall be used as follows:

(a) A steam vessel under way, excepting only a steam vessel with raft in tow, shall sound at intervals of not more than one minute three distinct blasts of her whistle.

(b) Every vessel in tow of another vessel shall, at intervals of one minute, sound four bells on a good and efficient and properly placed bell as follows: By striking the bell twice in quick succession, followed by a little longer interval, and then again striking twice in quick succession (in the manner in which four bells is struck in indicating time.)

(c) A steamer with a raft in tow shall sound at intervals of not more than one minute a schreeching or Modoc whistle for from three to five seconds.

(d) A sailing vessel under way and not in tow shall sound at intervals of not more than one minute—

If on the starboard tack with wind forward of a beam, one blast of her fog horn;

If on the port tack with wind forward of the beam, two blasts of her fog horn;

If she has the wind abaft the beam on either side, three blasts of her fog horn.

(e) Any vessel at anchor and any vessel aground in or near a channel or fairway shall at intervals of not more than two minutes ring the bell rapidly for three to five seconds.

(f) Vessels of less than ten tons registered tonnage, not being steam vessels, shall not be obliged to give the above-mentioned signals, but if they do not they shall make some other efficient sound signal at intervals of not more than one minute.

(g) Produce boats, fishing boats, rafts, or other water craft navigating by hand power or by the current of the river, or anchored or moored in or near the channel or fairway and not in any port, and not otherwise provided for in these rules, shall sound a fog horn, or equivalent signal, at intervals of not more than one minute.

Rule 15. Every vessel shall, in thick weather, by reason of fog, mist, falling snow, heavy rain storms, or other causes, go at moderate speed. A steam vessel hearing, apparently not more than four points from right ahead, the fog signal of another vessel shall at once reduce her speed to bare steerageway, and navigate with caution until the vessels shall have passed each other.

STEERING AND SAILING RULES.

Sailing Vessels.

Rule 16. When two sailing vessels are approaching one another so as to involve risk of collision one of them shall keep out of the way of the other, as follows, namely:

(a) A vessel which is running free shall keep out of the way of a vessel which is closehauled.

(b) A vessel which is closehauled on the port tack shall keep out of the way of a vessel which is closehauled on the starboard tack.

(c) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(d) When they are running free, with the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward.

Steam Vessels.

Rule 17. When two steam vessels are meeting end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each shall pass on the port side of the other.

Rule 18. When two steam vessels are crossing so as to involve risk of collision the vessel which has the other on her own starboard side shall keep out of the way of the other.

Rule 19. When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision the steam vessel shall keep out of the way of the sailing vessel.

Rule 20. Where, by any of the rules herein prescribed, one of two vessels shall keep out of the way, the other shall keep her course and speed.

Rule 21. Every steam vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

Rule 22. Notwithstanding anything contained in these rules every vessel overtaking any other shall keep out of the way of the overtaken vessel.

Rule 23. In all weathers every steam vessel under way in taking any course authorized or required by these rules shall indicate that course by the following signals on her whistle, to be accompanied whenever required by corresponding alteration of her helm; and every steam vessel receiving a signal from another shall promptly respond with the same signal or, as provided in Rule Twenty-six:

One blast to mean, "I am directing my course to starboard."

Two blasts to mean, "I am directing my course to port." But the giving or answering signals by a vessel required to keep her course shall not vary the duties and obligations of the respective vessels.

Rule 24. That in all narrow channels where there is a current, and in the rivers Saint Mary, Saint Clair, Detroit, Niagara, and Saint Lawrence, when two steamers are meeting, the descending steamer shall have the right of way, and shall, before the vessels shall have arrived within a distance of one-half mile of each other, give the signal necessary to indicate which side she elects to take.

Rule 25. In all channels less than five hundred feet in width, no steam vessel shall pass another going in the same direction unless the steam vessel ahead be disabled or signify her willingness that the steam vessel astern shall pass, when the steam vessel astern may pass, subject, however, to the other rules applicable to such a situation. And when steam vessels proceeding in opposite directions are about to meet in such channels, both such vessels shall be slowed down to a moderate speed, according to the circumstances.

Rule 26. If a pilot of a steam vessel to which a passing signal is sounded deems it unsafe to accept and assent to said signal, he shall not sound a cross signal; but in that case, and in every case where the pilot of one steamer fails to understand the course or intention of an approaching steamer, whether from signals being given or answered erroneously, or from other causes, the pilot of such steamer so receiving the first passing signal, or the pilot so in doubt, shall sound several short and rapid blasts of the whistle; and if the vessels shall have approached within half a mile of each other both shall reduce their speed to bare steerageway, and, if necessary, stop and reverse.

Rule 27. In obeying and construing these rules due regard shall be had to all dangers of navigation and collision and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

Rule 28. Nothing in these rules shall exonerate any vessel, or the owner or master or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of a neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Sec. 2. That a fine, not exceeding two hundred dollars, may be imposed for the violation of any of the provisions of this Act. The vessel shall be liable for the said penalty, and may be seized and proceeded against, by way of libel, in the district court of the United States for any district within which such vessel may be found.

Sec. 3. That the Secretary of Commerce and Labor of the United States shall have authority to establish all necessary regulations, not inconsistent with the provisions of this Act, required to carry the same into effect.

The Board of Supervising Inspectors of the United States shall have authority to establish such regulations to be observed by all steam vessels in passing each other, not inconsistent with the provisions of this act, as they shall from time to time deem necessary; and all regulations adopted by the said Board of Supervising Inspectors under the authority of this Act, when approved by the Secretary of Commerce and Labor, shall have the force of law. Two printed copies of any such regulations for passing, signed by them, shall be furnished to each steam vessel, and shall at all times be kept posted up in conspicuous places on board.

Sec. 4. That all laws or parts of laws, so far as applicable to the navigation of the Great Lakes and their connecting and tributary waters as far as Montreal, inconsistent with the foregoing rules are hereby repealed.

Sec. 5. That this act shall take effect on and after March first, eighteen hundred and ninety-five.

Approved, February 8, 1895.

CAPTAIN JOSEPH ROLEAU

The Soo River Pilot

NAVIGATION OF ST. MARY'S RIVER.

Rules and Regulations Governing the Movements and Anchorage of Vessels as Prescribed by the Secretary of the Treasury, and Amended January 22, 1901.

Rule 1. No vessel ascending or descending the St. Mary's river shall proceed at a greater speed than 9 statute miles per hour over the ground between Everens point and the northern floatlights in lower Hay lake of the 20-foot channel leading from Neebish channel, nor between the crib in upper Hay lake at the entrance of the 20-foot channel of the Frechette and Little Rapids cut and the government pier at Sault Ste. Marie, nor between the western end of Sault Ste. Marie canal pier and Pointe aux Pins light-house. Vessels of 500 tons or less are exempt from the provisions of this rule.

Rule 2. No vessel shall pass or approach another vessel moving in the same direction nearer than a quarter of a mile between Everens point and the northern end of the Dark Hole, nor between the first black spar buoy south of the gas buoy in the northern part of Little Mud lake and the northern float lights in lower Hay lake of the 20-foot channel leading from Neebish channel, nor between the southern entrance of the 20-foot channel of the Frechette and Little Rapids cut and the crib light at the northern entrance of the Little Rapids cut, nor between the western end of the Sault Ste. Marie canal piers and Big point.

Rule 3. All vessels bound up the St. Mary's river may pass other vessels moving in the same direction between the crib light in the northern part of Mud lake, and Everens point in Little Mud lake, between the northern part of the Dark Hole and the south red buoy at Stribbling point; also between the crib light-house at the northern entrance of Little Rapids or island cut and the government pier at Sault Ste. Marie, and between Big point and the light-house at Pointe aux Pins. Vessels bound down the river shall not pass or approach other vessels moving in the same direction nearer than a quarter of a mile, from below the wharf of the Michigan & Lake Superior Power Co. at Sault Ste. Marie, until Everens point is passed, excepting, however, in Hay lake.

Vessels bound down, of less than 500 gross tons without tows, may pass other vessels moving in the same direction in little Mud lake, provided the overtaking vessel shall pass to the westward of the black buoys and before reaching the Dark Hole.

No vessel passing another vessel shall move at a rate of speed greater than 9 statute miles per hour over the ground.

Rule 4. All vessels navigating the St. Mary's river may proceed at full speed and pass other vessels moving in the same direction between Point Detour and the turning channel buoy in the northern part of Mud lake, between the northern float lights of the 20-foot channel leading from the Neebish channel into Hay lake and the crib light at the entrance of Frechette and Little Rapids cut.

Special attention is called to rule 24 of the act of congress approved Feb. 18, 1895, giving right of way to descending vessels in the St. Mary's river.

Rule 5. In case one steamer desires to pass another going in the same direction on said river, at a point where such passing is permitted by these rules, the pilot of the steamer astern shall, if he intends to pass the steamer ahead on the right hand or starboard side, indicate such intention by giving one short blast of the steam whistle, and if he intends to pass such steamer ahead on the left hand or port side, he shall indicate such intention by giving two short blasts of the steam whistle. Upon the pilot of one steamer astern of another giving such signal, the pilot of the steamer ahead shall immediately answer by giving the same signal; but if he does not think it safe for the steamer astern to attempt to pass at that point, he shall immediately signify the same by giving several short and rapid blasts of the steam whistle; and under no circumstances shall the steamer astern attempt to pass the steamer ahead until such time as they have reached a point where it can be safely done, when said steamer ahead shall signify her willingness by blowing the proper signals; then the steamer ahead shall slacken to a slow rate of speed, and the steamer astern shall pass the overtaken steamer, giving the overtaken steamer as wide a berth as possible.

Steamers bound in opposite directions shall slow to half speed within one-quarter of a mile of each other until each has passed the other.

Rule 6. The patrolling vessels of the revenue cutter service shall always have the right of way over all other vessels, as indicated by the sailing signals given by any such patrolling vessel.

Rule 7. Three distinct blasts of the steam whistle, when sounded from a patrolling vessel, will indicate that the vessel to which such signal is given is proceeding at too high a rate of speed, and such vessel must immediately moderate her speed accordingly.

Rule 8. Three long blasts of the steam whistle, followed by one short blast, when sounded from a patrolling vessel, will indicate that the vessel to which such signal is given must stop until further orders from the patrolling vessel.

Rule 9. Two red lanterns, one above the other, hoisted on a patrolling vessel at night, will indicate to the vessel to which such signal is given that such vessel must stop and not proceed farther toward the position where such lights are displayed.

Rule 10. No vessel or raft shall anchor in any of the improved channels now abreast of the government piers at Sault Ste. Marie, except in distress or during a fog, and any vessel so anchored must always shift her anchorage when so directed by the officer in charge of a patrolling vessel to the spot designated by such officer.

Rule 11. Vessels navigating the St. Mary's river may anchor between Point Detour and Mud lake turning buoy, and at Sailors' Encampment close to the wharves of the sawmill. In Hay lake between the Neebish and Little Rapids channel outside of the channel as indicated by the ranges, but nothing in this rule shall be construed to prohibit any vessel from lying alongside of any wharf in said river.

Rule 12. Rafts being towed in the St. Mary's river will be required to use what is termed the "old channel." From Harwood point to Mud lake turning buoy they will move at the time designated by the officer in charge of the patrolling vessel. When lying by they must be moored out of the channel.

Rule 13. In navigating the St. Mary's river, in all cases where the foregoing rules are not applicable, the attention of masters and pilots is called to the sailing rules contained in the act of congress of Feb. 8, 1895.

Rule 14. All vessels navigating the St. Mary's river, in passing dredges and vessels at work on improvements to the channel, will be required to slacken their speed upon such dredge or other vessels engaged in such improvement giving the signal of three distinct blasts of the steam whistle.

Rule 15. The pilot of every steamer descending the St. Mary's river shall, when abreast of the Dark Hole gas buoy, and before passing around the bend of said river at Sailors' Encampment, give a signal of one blast of the steam whistle of 10 seconds' duration, which signal shall be answered by a blast of the steam whistle of the same duration by any vessel ascending said river within hearing. The pilot of every steamer ascending said river, not having heard such signal from a descending steamer, shall, when abreast of Everens point, and before passing around the bend of said river at Sailors' Encampment, give a signal of one blast of the steam whistle of 10 seconds' duration, which shall be answered by a blast of the same duration by any vessel descending said river within hearing. After such signal of one blast of the steam whistle of 10 seconds' duration shall have been given and answered, the usual passing signal must be given.

Rule 16. When a steamer, and tug towing scow from dredge at work deepening channel in Little Rapid cut, shall be moving in same direction, steamer may pass westward of tug providing former gives customary signal for steamer when passing another steamer moving in same direction, and this signal is answered by tug.

The tug will, however, keep well over to eastern side of channel as steamer passes. But overtaking steamer shall not pass tug towing scow if steamer be approaching in opposite direction so as to make three vessels abreast when thus passing.

Rule 17. No steamer stemming the current through the Dyke and island cut shall be allowed to tow more than one vessel without the aid of a tug, unless such steamer has the power to move the tow over the ground at the rate of at least 3 miles an hour.

Rule 18. Whenever vessels are compelled, by reason of an obstruction in any of the channels of the St. Mary's river to collect in certain parts of the river, the revenue cutter officer in charge shall direct where such vessels shall be moored and anchored, and no vessel moored or anchored, by reason of such obstruction, shall move, until directed by the revenue cutter officer in charge.

Rule 19. Whenever at Johnston's point, Sailors' Encampment, a red ball is displayed under a white ball, or two red lights are displayed under a white light, indicating that a steamer with a tow is bound down, no steamer with a tow bound up below Johnston's point shall meet or pass the bound-down tow until the bound-down tow has passed clear of Johnston's point.

Rule 20. No steamer navigating the St. Mary's river, either ascending or descending, shall pass another steamer or steamers moving either in the same or opposite direction, in such a position that more than two steamers shall be abreast of each other when thus passing. In case three steamers are liable to pass in a position where more than two of them will be abreast in passing, the overtaking steamer shall check its speed within a quarter of a mile of the overtaken steamer in order to avoid passing in such position.

Whenever a steamer bound down the St. Mary's river in the daytime enters the Dark Hole and a steamer bound up is approaching Johnston's point a white ball will be displayed on a pole at Johnston's point, Sailors' Encampment, in said river, until the steamer is abreast of Johnston's point, and whenever a steamer having a vessel or vessels in tow bound down in the day time enters the Dark Hole and a steamer bound up is approaching Johnston's point a red ball will be displayed under the white ball on the pole until the steamer is abreast of said point.

Whenever a steamer bound down said river at night enters the Dark Hole and a steamer bound up is approaching Johnston's point a white light over a red light will be displayed on said pole; and whenever a steamer bound down said river at night having a vessel or vessels in tow enters the Dark Hole and a steamer bound up is approaching Johnston's point a white light with two red lights under it will be displayed on said pole.

No flags or lanterns, however, will be displayed for tugboats without tows or for small vessels.

Schedule of Time to be Run in Certain Parts of St. Mary's River.

For the facilitation of speed calculations in connection with the rules and regulations governing the movements and anchorage of vessels in St. Mary's river, the treasury department publishes the following schedule of distances between certain points along the St. Mary's river, together with the time required to run those distances at a speed of nine miles an hour:

Sections.	Distance in statute Miles.	Time in minutes.
Mud lake buoy to Everens point	2⅝	17½
Everens point to Encampment crib light	¾	5
Encampment crib light to Dark Hole turn	1⅝	11
Dark Hole turn to Harwood point turn	3¼	21⅓
Harwood point turn to junction buoy, Hay lake.	3¼	21⅔
Junction buoy to upper lights, lower cut	2¾	18⅔
Lower cut to Frechette cut, full speed	....	....
Lower range, Frechette cut, to red can buoy	1½	10
Red can buoy to lower light, Little Rapids	1½	10
Lower light to north entrance light-house	1½	10
North entrance light-house to government pier.	1⅝	11
West end of piers to Big point	2¼	15
Big point to Pointe aux Pins light-house	3¼	21⅔
Through Dyke	1⅛	7½
Through island cut	1⅛	7½
Least towing time allowed vessels bound up through Dyke and island cut	....	22½

Capt. A. B. Davis, R. C. S., commanding United States steamer Morrill has supervision of the enforcement of the foregoing rules and regulations, and all complaints or appeals arising under them will be made to that officer by parties concerned.

ST. MARY'S FALLS CANAL RULES.

Extract From Act of Congress, Aug. 17, 1894.

Sec. 4. That it shall be the duty of the secretary of war to prescribe such rules and regulations for the use, administrations, and navigation of any or all canals and similar works of navigation that now are, or that hereafter may be, owned, operated or maintained by the United States as in his judgment the public necessity may require.

Such rules and regulations shall be posted in conspicuous and appropriate places, for the information of the public; and every person and every corporation which shall knowingly and wilfully violate such rules and regulations shall be deemed guilty of a misdemeanor and, on conviction thereof in any district court in the United States within whose territorial jurisdiction such offense may have been committed, shall be punished by a fine not exceeding five hundred dollars, or by imprisonment (in the case of a natural person) not exceeding six months, in the discretion of the court.

Rules and Regulations.—Administration.

1. The canal and all its appurtenances shall be in charge of the officer of the corps of engineers, United States army, detailed for that duty by the secretary of war. His representative at the locality shall be the assistant engineer in local charge of the works of river and harbor improvement, who, for canal purposes, shall be styled general superintendent. Except in case of emergency, all orders and instructions from the engineer officer in charge shall be communicated to the canal force through the general superintendent. In case of emergency, however, he is authorized to take such steps as may be immediately necessary without waiting for instructions from the engineer officer in charge.

2. The canal force shall consist of one superintendent, one clerk, three assistant superintendents, and such enginemen, watchmen, foremen, lockmen and laborers as may be necessary to the efficient opera-

tion of the canal and care of grounds and other public property pertaining to the canal.

3. The superintendent shall be charged with the immediate control and management of the entire force. He shall see that all the members perform their respective duties, and that all rules and regulations for use of the canal and grounds are duly enforced, to which end he is authorized to give all necessary orders and directions in accordance with said rules and regulations; both to employes of the government and to any or every person within the limits of the canal or the grounds pertaining thereto, whether navigating the canal or not. In case of his absence or disability his duties shall be performed on their respective watches by the assistant superintendents.

4. The clerk shall keep the books and records pertaining to the canal and grounds. He shall see to the collection of all required statistical information relating to the business of the canal. He shall prepare all vouchers and accounts and perform all other duties that may arise of a similar character.

5. The remainder of the canal force shall be divided into three watches, each consisting of one assistant superintendent and the necessary enginemen, watchmen, foremen, lockmen and laborers. The duration of each watch shall be eight hours, and the watches shall be kept in rotation, but in case of emergency, the superintendent may vary the duration of the watches, the ordinary routine to be resumed as soon as the emergency has passed.

6. Under the personal direction of its assistant superintendent, the individual members of each watch during its tour of duty will be employed in passing vessels through the canal, in the care and protection of the canal and grounds, as well as of all other property belonging to the United States. They are enjoined to be diligent and attentive in the performance of their duties, courteous but firm to all with whom they come in contact, and to never lose sight of the fact that the purpose of their employment is to facilitate the use of the canal.

Use and Navigation of the Canal.

7. The canal grounds when used in these rules will mean all of these grounds have been set aside for the use of the canal or occupied in its construction and including the area covered by its riparian rights. Therefore, the western limit is the end of the pier on which the light-house stands and the eastern limit is the northeastern corner of Old Fort Brady reservation. The canal is the water lying between these two points and the bed and banks containing the same.

8. The movement of all vessels, boats or other floating things, in the canal shall be under the direction of the superintendent and his assistants, whose orders and instructions must be obeyed.

9. All steamers desiring to use the locks shall signal for the same by two long and two short blasts of the whistle.

10. No tow shall enter or pass through the canal with a tow line more than 400 feet in length.

11. In passing the canal, vessels or boats belonging to the United States government shall have precedence over all others. All registered merchant vessels must pass through the canal and locks in the order of their arrival at the canal, unless otherwise directed by the superintendent or his assistant in charge. The time of arrival at the canal will be the time of crossing the straight lines which join the extremes of the piers of the eastern and western ends of the canal, respectively. Unregistered craft will not be locked separately unless specially permitted by the superintendent or by one of the assistant superintendents of the canal.

12. No person in charge of a boat coming from above shall bring it within 400 feet of the upper gates until they are made ready for it to enter, and no person in charge of a boat coming from below shall bring it within 200 feet of the lower gates until they are made ready for entrance.

13. Upon each passage through the canal, masters or clerks of vessels or boats shall report to the canal office, upon prescribed forms, a statement of passengers, freight, and registered tonnage, and such other statistical information as may be required by the blank forms which are issued to them for the purpose.

14. No business, trading, or landing of freight or baggage will be allowed on or over the canal piers or lock walls, nor over the piers or grounds forming a part of the canal or its appurtenances, except such small articles as may be readily carried in the hand. All persons in charge of, or employed on, any ferry boat are prohibited landing such boat at any of the canal piers.

15. No person in charge of, or employed on, any vessel or boat shall moor it to the piers except when specially permitted by the superintendent, and then only in such places and for such times as he may direct.

16. No person shall throw any material of any kind into the canal; nor shall any person clean flues in the locks.

17. All persons, whether in charge of vessels or not, are prohibited from wilfully or carelessly damaging the canal grounds, the canal, or any part thereof.

18. No person shall enter or navigate the canal with a boat which when entering, or while navigating the canal, shall have an iron or irons projecting from it, or rough surface or surfaces on it, which would be liable to damage the lock walls or canal piers.

19. No person shall cause or permit any vessel or boat of which he is in charge, or on which he is employed, to in any way obstruct the canal, or delay in passing through it, unless he is permitted to do so by the superintendent or one of the assistant superintendents of the canal.

20. In case of any vessel, boat, or other craft or raft sinking or grounding in the canal, or otherwise obstructing it, the general superintendent, or, in his absence, the superintendent of the canal, or the assistant superintendent for the time being, acting as superintendent, shall have the right to take such possession of such vessel, boat, or other craft or raft, as shall be necessary for the purpose, and remove it and clear the canal of the obstruction caused by it, and no one shall interfere with or prohibit him from doing so, or do anything that will tend to interfere with or prohibit him from doing so.

21. On the canal being obstructed by a vessel or boat or other craft, or a raft, by sinking, grounding or otherwise, the general superintendent of the canal, the superintendent or one of the assistant superintendents, in the contingency and in the sequence named in the preceding paragraph, may give notice in writing.

ST. CLAIR FLATS SHIP CANAL, MICHIGAN.

The Law—Extract From Act of Congress, Aug. 17, 1894.

Sec. 4. That it shall be the duty of the secretary of war to prescribe such rules and regulations for the use, administration and navigation of any or all canals and similar works of navigation that now are, or that hereafter may be, owned, operated or maintained by the United States as in his judgment the public necessity may require.

Such rules and regulations shall be posted in conspicuous and appropriate places for the information of the public; and every person and every corporation which shall knowingly and wilfully violate such rules and regulations shall be deemed guilty of a misdemeanor and, on conviction thereof in any district court in the United States and within whose territorial jurisdiction such offense may have been committed, shall be punished by a fine not exceeding $500, or by imprisonment (in the case of a natural person) not exceeding six months, in the discretion of the court.

Rules and Regulations.

1. The canal and all its appurtenances shall be in charge of the officer of the corps of engineers U. S. A., detailed for that duty by the secretary of war. His representative at the locality shall be the custodian of the canal, who shall customarily receive his orders and instructions from the engineer officer in charge. In cases of emergency, however, the custodian shall have authority to take such steps as may be immediately necessary without waiting for instructions from the engineer officer in charge.

2. The custodian of the said canal shall be charged with the immediate control and management thereof, and of the grounds and public property pertaining thereto. He shall see that all laws, rules and regulations for the use of the canal and grounds are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the government and to any or every person within the limits of the canal or the grounds pertaining thereto, whether navigating the canal or not. In case of the absence or disability of the custodian, his duties shall be performed by an acting custodian to be designated by the engineer officer in charge.

3. The custodian is enjoined to be diligent and attentive in the performance of his duties, courteous but firm to all with whom he comes in contact, and never lose sight of the fact that the purpose of his employment is to facilitate the use of the canal.

Use and Navigation of the Canal.

Definition.—St. Clair Flats ship-canal comprises the dykes, the water between the dykes, and the improved channels of approach both above and below the dykes.

4. The custodian of the canal, either by himself or through assistants, shall direct the movements of all vessels, boats, and other floating things in the canal, and of all persons upon the dykes. The directions, orders and instructions given by him or his assistants in directing the movement of any vessel, boat or other floating thing in the canal shall be obeyed by all persons in charge of or employed upon

said vessel, boat or other floating thing, and by each and every person upon the dykes.

5. All persons in charge of or employed upon vessels or boats are forbidden to throw anything into the canal or to cause or permit their respective vessels.

To land or tie up to the banks unless for government business.

To enter the canal two or more abreast.

To pass another vessel or boat while going in the same direction in the canal.

To follow another vessel or boat at a distance of less than 500 feet except when in tow.

To pass the canal in more than one line going each way.

To obstruct the canal in any way, or to intentionally delay, by slow passage through the canal, or by any other means, the progress of other vessels or boats navigating the same.

To hug the canal banks in passing, or to deviate more from the middle of the canal than is necessary for safe navigation.

To attempt passing the canal in the face of running ice without the express permission of the custodian of the canal.

To pass the canal at a rate of speed exceeding eight miles per hour.

6. No one in charge of, or employed on, a sailing vessel shall cause or permit such vessel to beat through the canal. He shall tow the vessel through or wait for a fair wind.

7. No one in charge of, or employed on a vessel, however, propelled, shall cause or permit such vessel to pass through the canal with its sail or sails up, unless it be a sail vessel running with a fair wind.

8. No one in charge of, or employed on a vessel, shall cause or permit such vessel to enter, or attempt to pass through the canal, at a time when the available depth of water in the canal is not as great as the draft of the vessel; and the custodian of the canal shall, from time to time, announce in the marine columns of the newspapers the available depth of water in the canal.

9. To prevent blockades in the canal or its approaches, the custodian of the canal is authorized to detain any vessel at either end thereof until, in his opinion, a safe passage can be secured, and no

one shall do anything to interfere with or prohibit his doing so; or anything that will tend to, or is likely to, interfere with or prohibit his doing so.

10. All persons are prohibited from wilfully or carelessly injuring or damaging the revetment work of the dykes, or the trees growing on the dykes, or any of the government buildings or other public property pertaining to the canal or the dykes, or any part thereof.

11. In case of any boat, vessel, or other craft, or raft, sinking or grounding in the canal or otherwise obstructing it, the officer, or agent of the United States in charge of the canal shall have the right to take such possession of such vessel, boat, or other craft, or raft, as shall be necessary for the purpose, and remove it, and clear the canal of the obstruction caused by it; and no one shall interfere with or prohibit him from doing so, or do anything that will tend to interfere with or prohibit him from doing so; provided, that the officer, or agent of the United States, may, in his discretion, give notice in writing to the owners of any vessel, boat, or other craft, or raft, obstructing the canal as aforesaid.

The foregoing rules and regulations for the administration, use and navigation of St. Clair Flats chip-canal, shall have full force and effect from and after July 1, 1895.

RULES AND REGULATIONS FOR PORTAGE LAKE SHIP CANALS ACROSS KEWEENAW POINT, MICHIGAN.

1. Authority of Canal Officers—The movement of all boats and floating things in the canals, and in the approaches thereto, shall be under the direction of the superintendent or his authorized assistants.

2. Signals—On entering the upper canal at either entrance steamers or tugs must blow their whistles for one minute, and in case two boats shall be in the canal at the same time, each shall so modify its speed as to pass the other at "Lily Pond," and when one arrives at "Lily Pond" before the other, a stop must be made until the other arrives and passes. In navigating the lower canals vessels will be governed by the following well-known rule: "Whenever a steamer is nearing a sharp bend or curve in the channel, where from the heights of the banks or other cause a steamer approaching from the opposite direction cannot be seen from a distance of half a mile, the pilot of

such steamer, when he shall have arrived within a half a mile of such curve or bend give a signal by one long blast of the steam whistle, which signal shall be answered by a similar blast given by the pilot of any approaching steamer that may be within hearing. Should such signal be so answered by a steamer upon the farther side of such bend, then the usual signals for the meeting and passing shall immediately be given and answered, but if the first alarm signal of such pilot be not answered, he is to consider the channel clear and govern himself accordingly."

3. Speed—The rate of speed while passing through the canals, and cuts in Portage river, shall not exceed 5 miles per hour.

4. Keeping in the Center—In passing through the canals the center must be kept all the way through, except in passing other craft.

5. Rafts—The passage of "bag" or "sack" rafts, or of loose logs, into or through the canals is prohibited.

Rafts shall be made up with logs parallel to each other, secured and held closely together by cross-sticks, chains or cable, at each set of joints in the booms.

Rafts shall not be of greater dimensions either way than 50 feet wide by 600 feet long, and if any longer than 300 feet shall be handled by two tugs; and in all cases must be handled by sufficient tug power to make headway against the current, and guide the raft so as to give half the channel to passing vessels.

No raft shall pass through the upper canal, i. e., between Lake Superior and Portage lake, unless by special permission of the superintendent or his authorized assistants, who will direct a time for passage that will least interfere with other navigation.

Masters of tugs and other vessels in charge of rafts are required to avoid damaging canal revetments and displacing buoys and spars. They shall keep careful watch when passing aids to navigation, and should any be accidently displaced they shall make every effort to leave the same in shoal water out of the main channel, and report the fact to the superintendent or his authorized assistants.

6. Harbor of Refuge—In case the upper canal is used as a shelter from storms all craft so using it are required to make fast at a point known as "Lily Pond," midway between Portage lake and Lake Superior, and except in case of storms the use of the canal longer than twenty-four hours shall require special permission of the superintendent.

7. Making Fast—Making fast to the trestles of the elevated walk leading to the pier head lighthouse, to the entrance piers, or to the revetments at the sides of the canal, except at "Lily Pond," is strictly prohibited.

8. Injury to Piers, Cribs and Sheet Piling—Vessels shall use great care not to strike or injure the cribs, piers, sheet piling or any structures pertaining to the canals.

9. Refuse in Canals—No person shall roll or throw any stones, ashes, cinders or other material into the canal or the approaches thereto, or place any such material on any bank or berme of the canals, so that it is liable to be rolled, thrown or washed in.

10. Draught of Boats—No vessel shall enter the canals whose actual draught exceeds the least depth of water in the channels of the canals as given by the superintendent.

11. Obstructing Navigation—Any one who shall wilfully or through carlessness in any way obstruct the free navigation of the canals, or by the violation of any of the laws or regulations governing the canals or those using them, delay or inconvenience any boat having the right to use the canals, will be liable to prosecution, and shall be responsible for all damages and delays, and for the expense for removing the obstructions.

12. Occupation of U. S. Piers, Etc.—No person or parties shall tie, or moor against the canal revetments or piers, scows, rafts or vessels of any kind, to load or unload into or from said scows or vessels across the canal revetments or piers, cordwood, timber or material of any kind, or pile the same up on the canal revetments or piers, or right of way of canals.

13. Commercial Statistics—The masters or clerks of vessels using the canals shall furnish in writing to the superintendent or his assistants a detailed statement of passengers and cargo carried.

RULES AND REGULATIONS FOR THE GOVERNMENT OF THE HARBOR OF REFUGE, SAND BEACH, MICHIGAN.

In accordance with the provisions of an act of congress, approved June 19, 1882, the following regulations are prescribed respecting the use of this harbor:

1. All boats, barges and vessels entering the harbor will be required to take such positions as may be assigned them by the custodian, who will direct their movements, either from the breakwater or from the government steam launch on the harbor.

2. In the absence of any directions as to positions, boats, barges and vessels entering the harbor will observe the following general rule: All steam craft will, when practicable, make fast directly to the snubbing posts in the breakwater. Sailing craft will so locate themselves that they will not lie in the way of other vessels entering the harbor, or in any way interfere with the work of construction or repairs that may be in progress at the time.

3. The use of chains in making fast to the breakwater will not be permitted, and lines must be attached to the snubbing posts only.

4. Steam craft with barges or vessels in tow, will, if practicable, at once place them compactly alongside the breakwater; either taking in the tow line entirely, or passing them on the breakwater so as not to interfere in any way with the landing or departure of boats or vessels between them. If impracticable to place them alongside the breakwater, they will each drop anchor and at once take in all tow lines extending from one to the other.

5. Passenger boats will in general have the preference as to location and attention by the custodian. Rafts will give way to all documented craft.

6. All classes of boats, barges, vessels or other floating property making fast to the breakwater must at once place such fenders between themselves and the breakwater as may be thought necessary by the custodian to pervent chafing or other damage.

7. The unloading of wood, coal, ballast, stone or freight of any class upon the breakwater is expressly prohibited, except in certain cases allowed by special permission from the custodian.

8. Each and every piece of floating property made fast to the breakwater or anchored in the harbor must keep outboard from sunset to sunrise a conspicuous white light, and must have upon it, or in immediate charge of it, a watchman during the entire time such floating property is in the harbor. All colored lights must be at once taken in, or covered, on dropping anchor or making fast to the breakwater.

RULES AND REGULATIONS FOR NAVIGATING THE SAINT CLAIR RIVER, MICH., IN THE VICINITY OF STAG ISLAND.

The United States government having improved the channel to the westward of Stag Island by the removal of shoals, the following regulation is promulgated by the Secretary of War in pursuance of the provisions of Section 4 of the river and harbor act of August 18, 1894, as amended by Section 11 of the river and harbor act of June 13, 1902.

All through-bound vessels in passing through the river at this point shall keep to the right, that is to say, all up-bound boats shall pass through the eastern channel and all down-bound boats through the western channel.

This rule shall only apply to through-bound vessels and not to vessels running between local points on the river, which vessels may take either channel, conforming to the ordinary rules of the road at sea.

ROBERT SHAW OLIVER,
Assistant Secretary of War.

War Department, January 8, 1907.

The Canadian government have concurred in the foregoing regulations for the navigation of the St. Clair river.

REGULATIONS AND INSTRUCTIONS RELATING TO THE SAVING OF LIFE.

The following signals, recommended by the International Marine Conference for adoption by all institutions for saving life from wrecked vessels, have been adopted by the life-saving service of the United States:

1. Upon the discovery of a wreck by night, the life-saving force will burn a red pyrotechnic light or a red rocket to signify "You are seen; assistance will be given as soon as possible."

2. A red flag waved on shore by day, or a red light, red rocket or red Roman candle displayed by night, will signify: "Haul away."

3. A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket or white Roman candle fired by night, will signify: "Slack away."

4. Two flags, a white and a red, waved at the same time on shore by day, or two lights, a white and a red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify: "Do not attempt to land in your own boats; it is impossible."

5. A man on shore beckoning by day, or two torches burning near together by night, will signify: "This is the best place to land."

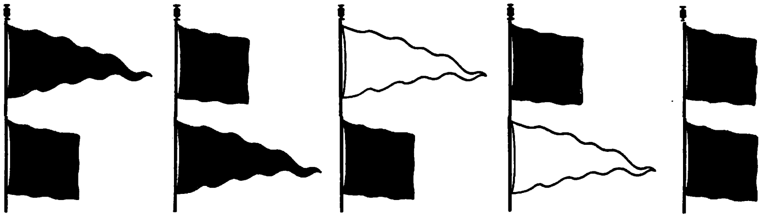
REPORTS.

All vessels passing through the Soo, up and down through the Portage, and in and out of Duluth and Superior harbors, are required to hand in statements of their vessels, passengers, cargo, etc. Books of printed forms are supplied at these points free of charge. At the locks these statements are handed to an official at the canal office.

For the Portage, or for Duluth or Superior, these blanks are filled out and dropped in to the nearest postoffice. In passing through the Portage where no stop is made, these reports can be dropped in the postoffice at the first port of arrival. A failure to send in these statements is punishable by a fine.

STORM SIGNALS.

As Displayed on the Great Lakes at United States Weather Bureau Stations.



N. E. Storm. **S. E. Storm.** **N. W. Storm.** **S. W. Storm.** **Hurricane or very severe storm.**

Information Signals (Red or White Pennant Displayed Alone) Have Been Discontinued.

Explanation.

Storm Signal. A red flag with a black center indicates that a storm of marked violence is expected.

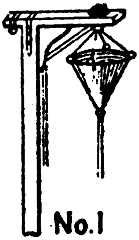
The pennants displayed with the flags indicate the direction of the wind; red, easterly (from northeast to south); white, westerly (from southwest to north). The pennant above the flag indicates that the wind is expected to blow from the northerly quadrants; below, from the southerly quadrants.

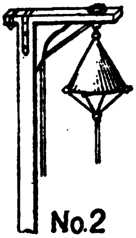
By night, a red light indicates easterly winds, and a white light above a red light, westerly winds.

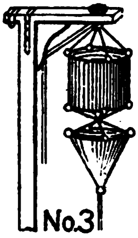
Hurricane Signal. Two red flags with black centers displayed one above the other, indicate the expected approach of tropical hurricanes, and also of those extremely severe and dangerous storms which occasionally move across the lakes and the northern Atlantic coast. Hurricane warnings are not displayed at night.

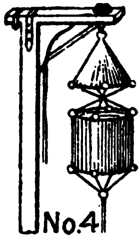
CANADIAN STORM SIGNALS.

Day Signals.


No. 1


No. 2


No. 3


No. 4

Day Signal.	If displayed on Lakes Superior, Erie or Ontario indicates—	If displayed on Lake Huron or in Georgian Bay indicates—
No. 1.	A moderate gale is expected at first from an easterly direction.	A moderate gale is expected from a southerly direction.
No. 2.	A heavy gale is expected at first from a westerly direction.	A heavy gale is expected at first from a northerly direction.
No. 3.	A heavy gale is expected at first from an easterly direction.	A heavy gale is expected at first from a southerly direction.
No. 4.	A heavy gale is expected at first from a westerly direction.	A heavy gale is expected at first from a northerly direction.

The cone when displayed alone indicates that it is expected that the wind will attain a velocity of 25 miles an hour but will not exceed 35 miles, and it is not intended to indicate that an ordinary well-found vessel should stay in port, but is simply a warning that strong winds are expected from the quarter indicated.

The drum will always be hoisted when the velocity of the wind is expected to exceed 35 miles an hour.

Night Signals.

The Night Signal corresponding to Day Signals Nos. 1 and 3, is two lanterns hanging one above the other.

The Night Signal corresponding to Day Signals Nos. 2 and 4, is two lanterns hanging side by side.

GOVERNMENT SOUNDINGS.

Lake men are sometimes puzzled as to the depths given on charts and in the Government bulletins. In sounding a certain place they sometimes get a different depth than that given by the Lake Survey and the impression so gained by many is that harbor charts and bulletins are not reliable. On the contrary, the Lake Survey charts and bulletins are reliable and when their method of showing depths is properly understood it will be found that they are exact in every particular. If a certain harbor was sounded in the month of June and again in September the depths found would be very different on account of the changes in the lake level. The soundings of the Lake Survey are so made that, by proper attention, the exact depths can be found at any time. The sea level at New York is taken as a base. Then the heights of the different lakes, above the level of New York, is found each month. These levels are published in the bulletins and supplements that are issued from the Lake Survey office, free of charge. On some charts you will find "Soundings are reduced to standard low water datum," and on other charts you will find "Soundings are reduced to the mean level of the lake from 1860 to 1875." If your chart shows "Soundings reduced to standard low-water datum," then all that is necessary is to find what this level is and then find the latest published monthly level. For instance, the standard low-water for Lake Erie is found to be 569.91 feet above New York. Then we will say that you are making a sounding in the month of September, 1906. By reference to the monthly supplement you will find that the September level is 572.40. By this you will find that the water is 2.49 feet deeper in September 1906 than is shown on the chart. On the other hand if your Lake Erie chart reads "Soundings reduced to mean level of lake from 1860 to 1875" by reference to the bulletin you will find this level was 572.80. Then again you get the level of Lake Erie for September, 1906, which was 572.40, and you will find that the depth of Lake Erie for September is .40 of a foot less than is shown on the chart.

Special Note.

If your chart reads "Soundings reduced to standard low-water datum," you can figure that the water is at least two feet deeper than is shown on the chart, while if your chart reads, "Soundings reduced to mean level of lake from 1860 to 1875," you can figure that the water is probably six inches less than is shown on the chart. On all the new charts the soundings are reduced to standard low water datum.

BRIDGE SIGNALS.

Buffalo.

Michigan street bridges	3 blasts
Ohio Basin bridge	3 long, 3 short blasts
Evans slip bridge	3 blasts
International bridge, Niagara river	1 long blast

Ashtabula.

Ashtabula bridge	1 long blast

Cleveland.

L. S. & M. S. Railway bridge (first bridge)	1 long, 2 short blasts
Main street bridge (second bridge)	2 blasts
Superior street viaduct	3 blasts
All bridges above viaduct	4 blasts
Old River Bed bridges	1 long, 1 short, 1 long, 1 short

Lorain.

Both bridges	1 long, 2 short blasts

Toledo.

All bridges in main river	3 blasts
Dayton slip bridge	4 blasts
Swan creek—Perry street bridge	3 blasts
Lafayette street bridge	2 blasts
St. Clair street bridge	1 long, 2 short blasts
Erie street bridge	3 long blasts
Clover Leaf Railway bridge	3 long blasts

Duluth.

Aerial bridge	3 blasts
Interstate bridge	3 blasts
Northern Pacific bridge, Duluth side	3 blasts
Northern Pacific bridge, West Superior side	2 long, 2 short blasts
St. Paul bridge, West Duluth	3 blasts
Howard pocket bridge, near dry dock	3 long, 2 short blasts

Chicago.

Three whistles is the signal for all Chicago and South Chicago bridges, excepting Kinzie street bridge, Ashland avenue bridge, and Fuller street bridge. Kinzie street bridge is the first bridge up the North branch. Ashland avenue bridge is in the South branch, and

Fuller street bridge is in the South Fork. Blow four blasts for Kinzie street bridge, four blasts for Ashland avenue bridge, and five whistles for Fuller street bridge.

Milwaukee.

Three whistles is the signal for all Milwaukee bridges excepting West Water street bridge, across the Menominee river, the Railway bridge just east of the West Water street bridge, and the Chicago and Northwestern bridge, across the Kinnickinnic. The signal for these bridges is four blasts. Another exception is the Point street bridge, entrance to Green Bay canal, the signal for this being five blasts.

Green Bay.

Chicago and Northwestern Railway bridge (first bridge)	3 blasts
Main street bridge (second bridge)	2 short, 1 long
Walnut street bridge (third bridge)	1 long, 2 short
Mason street bridge (fourth bridge)	1 long, 1 short, 1 long
Upper Railroad bridge	3 blasts

BRIDGE HOURS.

At the lake ports mentioned below the drawbridges will not be opened for the passage of vessels during the time specified as "Bridge Hours." This is for the benefit of people going to and from their places of business. Bridge hours are for week days only.

Buffalo—6:30 a. m. to 7:30 a. m; 5 p. m. to 6 p. m.

Cleveland—6:15 a. m. to 7:15 a. m.; 5 p. m. to 6 p. m.

Lorain—5 a. m. to 7 a. m.; 5 p. m. to 6 p. m.

Milwaukee—6:15 a. m. to 7 a. m. only.

Racine—6:30 a. m. to 7 a. m.; 12 to 12:20 noon; 12:40 to 1 noon; 6 p. m. to 6:30 p. m.

Chicago—All bridges across the main river and across the South branch of the Chicago river, from its junction with the main river, and as far south as Twelfth street, including the latter, and across the North branch of the Chicago river at Kinzie street, the hours are 6 a. m. to 8 a. m., and 5 p. m. to 7 p. m.

All bridges across the North branch of the Chicago river, from Kinzie street, exclusive, to Halstead street, inclusive, and across the South branch of the Chicago river, from Twelfth street, exclusive, to Halstead street, inclusive, the hours are 6 a. m. to 7 a. m., and 5:30 p. m. to 6:30 p. m.

All other bridges—6 a. m. to 7 a. m., and 6 p. m. to 7 p. m.

GREATEST DEPTHS OF WATER ON EACH LAKE AS RECORDED BY THE U. S. LAKE SURVEY.

Lake Superior—168 fathoms (1008 feet) found at a point 61 miles E. ½ south from Passage Island light.

Lake Michigan—145 fathoms (870 feet) found at a point 26 miles S. W. by W. ½ W., from Point Betsey light.

Lake Huron—125 fathoms (750 feet) found at a point 58 miles E. ¼ S. from Thunder Bay Island light.

Lake Erie—35 fathoms (210 feet) found at a point 6½ miles S. E. from Long Point.

Lake Ontario—123 fathoms (738 feet) found at a point 28 miles N. E. by E. from Charlotte.

THE GREATEST KNOWN DEPTH OF WATER IN THE WORLD.

The greatest known depth of water in the world was discovered by the United States Survey ship "Nero," in 1900, near the island of Guam, in the Pacific ocean. This sounding was 5269 fathoms, or nearly six statute miles.

These deep-sea soundings are made with a sixty pound iron ball attached to a wire. This ball detaches itself on striking the bottom.

The pressure of water in the great depths of the ocean is about one ton to the square inch for each 1,000 fathoms of water. Therefore in the deepest recorded spot in the ocean as given above there would be a pressure of over five tons to the square inch.

REGULATIONS FOR THE SALE OF LAKE SURVEY CHARTS.

1. The free distribution of these charts is held to be prohibited by the Act of Congress approved May 4, 1878, and in accordance with the requirements of the law the prices charged cover only the cost to the United States of paper and printing.

2. Charts may be purchased by any one, at the prices given in the following catalogue, from U. S. Lake Survey office, Campau Building, Detroit, Mich., or from U. S. Engineer Office, 540 Federal Building, Buffalo, N. Y.

3. Payments must be made before charts are sent, and if made by mail must be by postal or express money order payable to the order of U. S. Lake Survey Office if ordered from Detroit, or to the order of U. S. Engineer Office if ordered from Buffalo. These charts may also be obtained, for cash only, at the U. S. Canal Office at Sault Ste. Marie, Mich.

4. Charts will be sent by express, the express charges to be paid by purchaser on receipt of charts, or free by mail at purchaser's risk. Purchasers should indicate, when ordering charts, whether they wish them sent by express or mail. The latter will be used when no choice is indicated.

5. Purchasers should specify the index number and name of each chart desired, as given in the following catalogue.

6. Complete sets of these charts are on file at the following U. S. Engineer Offices, where they may be seen by any one, but purchases must be made from one of the offices named in paragraph 3 above:

Duluth, Minn., 519 Providence Building.

Milwaukee, Wis., U. S. Custom-House.

Chicago, Ill., 508 Federal Building.

Grand Rapids, Mich., 57 Park Street.

Cleveland, Ohio, 262 Huron Street.

Oswego, N. Y., Second National Bank Building.

Number	Price	Index	NAME OF CHART	Number	Price	Index	NAME OF CHART
			LAKE ONTARIO				LAKE ONTARIO
	$0.15	O	Lake Ontario (colors)		.15	Om	Coast-chart No. 3 (colors)
	.20	Oe	St. Lawrence River No. 1 (colors)		.15	On	Coast-chart No. 4 (colors)
	.15	Of	St. Lawrence River No. 2 (colors)		.20	Oo	Coast-chart No. 5
	.15	Og	St. Lawrence River No. 3 (colors)		.12	Ol 7	Oswego Harbor (colors)
	.15	Oh	St. Lawrence River No. 4 (colors		.15	Ol 9	Little Sodus Bay (colors)
	.15	Oi	St. Lawrence River No. 5 (colors)		.15	Om 3	Great Sodus Bay (colors)
	.15	Oj	St. Lawrence River No. 6 (colors)		.15	On 1	Charlotte Harbor (colors)
	.15	Ok	Coast-chart No. 1 (colors)		.20	Oo 7	Niagara Falls
	.12	Ol	Coast-chart No. 2 (colors)				

Number	Price	Index	NAME OF CHART
			LAKE ERIE
1	.15	E	**Lake Erie (colors)**
	.15	Ea	Coast-chart No. 1 (colors)
	.15	Eb	Coast-chart No. 2 (colors)
	.15	Ec	Coast-chart No. 3 (colors)
	.15	Ed	Coast-chart No. 4 (colors)
	.15	Ee	Coast-chart No. 5 (colors)
	.18	Ef	Coast-chart No. 6 (colors)
	.15	Eg	Coast-chart No. 7 (colors)
1	.15	Em	**Detroit River (colors)**
1	.15	En	**Lake St. Clair (colors)**
1	.15	Eo	**St. Clair River (colors)**
	.17	Ea 1	Buffalo Harbor and Niagara River to the Falls (colors
	.10	Ea 8	Dunkirk Harbor (colors)
	.11	Ec 2	Erie Harbor and Presque Isle (colors)
	.15	Ec 5	Conneaut Harbor (colors)
	.15	Ed 2	Ashtabula Harbor (colors)
	.12	Ed 5	Fairport Harbor (colors)
	.15	Ee 3	Cleveland Harbor (colors)
	.15	Ee 6	Lorain Harbor (colors)
	.12	Ef 4	Huron Harbor (colors)
	.13	Ef 6	Sandusky Bay (colors)
	.15	Eg 7	Maumee Bay and Maumee River (colors)
			LAKE HURON
1	.20	H	**Lake Huron and Georgian Bay (colors)**
	.20	Ha	South End of Lake Huron
	.18	Hb	Coast-chart No. 2 (Saginaw Bay) (colors)
	.13	Hd	**Straits of Mackinac (colors)**
	.15	He	Coast-chart No. 8 (colors)
	.16	Hf	Coast-chart No. 7 (colors)
	.15	Hg	Coast-chart No. 6 (colors)
	.16	Hh	Coast-chart No. 5 (colors)
	.10	Hb 2	Sand Beach Harbor of Refuge (colors)
	.20	Hb 11	Saginaw River
	.12	Hb 17	Tawas Harbor (colors)
	.15	Hc 5	Thunder Bay (colors)
	.12	Hc 7	Presque Isle and Middle Island (colors)
1	.17	Hd 8	**St. Mary's River No. 1 (colors)**
	.15	Hd 9	St. Joseph Channel and Western End of North Channel (colors)
1	.18	Hd 10	**St. Mary's River No. 2 (colors)**
			LAKE MICHIGAN
1	$0.15	M	**Lake Michigan (colors)**
	.15	1 M	North End of Lake Michigan (colors)
	.15	2 M	South End of Lake Michigan (colors)
	.15	Ma	Beaver Island Group (colors)
	.18	Mb	Grand and Little Traverse Bays (colors)
	.15	Mc	Coast-chart No. 9 (colors)
	.15	Md	Coast-chart No 8 (colors)

Number	Price	Index	NAME OF CHART
			LAKE MICHIGAN
	.15	Me	Coast-chart No. 7 (colors)
	.15	Mf	Coast-chart No. 6 (colors)
	.11	Mg	Coast-chart No. 5 (colors)
	.15	Mh	Coast-chart No. 4 (colors)
	.13	Mi	Coast-chart No. 3 (colors)
	.15	Mj	Coast-chart No. 2 (colors)
	.20	Mk	Coast-chart No. 1
	.20	Ml	South End of Green Bay
	.15	Mm	North End of Green Bay (colors)
	.10	Ma 11	Manistique Harbor (colors)
	.10	Mb 4	Charlevoix Harbor (colors)
	.06	Mb 11	South Fox Island Shoals (colors)
	.15	Mb 14	Manitou Passage (colors)
	.15	Mc 2	Frankfort Harbor (colors)
	.15	Mc 5	Portage Lake Harbor, Manistee County (colors)
	.13	Mc 6	Manistee Harbor (colors)
	.11	Md 1	Ludington Harbor (colors)
	.15	Md 8	Muskegon Harbor (colors)
	.13	Mg 2	Harbor at Michigan City (colors)
	.20	Mg 8	Lake Front, Chicago (colors)
	.16	Mi 5	Milwaukee Harbor (colors)
	.13	Mj 5	Sheboygan Harbor (colors)
	.13	Mk 1	Manitowoc Harbor (colors)
	.15	Ml 4	Sturgeon Bay, Canal, and Harbor of Refuge (colors)
	.15	Ml 10	Head of Green Bay (colors)
	.15	Mm 2	Little Bay de Noc (colors)
			LAKE SUPERIOR
1	.15	S	**Lake Superior (colors)**
	.15	1 S	Lake Superior No. 1 (colors)
	.15	2 S	Lake Superior No. 2 (colors)
	.15	3 S	Lake Superior No. 3 (colors)
	.17	Sa	Coast-chart No. 1 (colors)
	.20	Sf	Coast-chart No. 6 (colors)
	.18	Sh	Coast-chart No. 8, including Isle Royal (colors)
1	.15	Sa 1	**St. Mary's River No. 3 (colors)**
	.15	Sc 1	Grand Island (colors)
	.15	Sc 10	Marquette and Presque Isle Harbors (colors)
	.15	Sd 3	Huron Bay and Huron Islands (colors)
	.15	Sd 4	Keweenaw Bay (colors)
	.20	Sd 5	Portage Lake and River (colors)
	.06	Sd 9	Copper Harbor (colors)
	.06	Sd 10	Agate Harbor (colors)
	.20	Sd 11	Eagle Harbor
	.06	Sd 12	Eagle River (colors)
	.06	Se 1	Ontonagon Harbor (colors)
	.20	Sf 1	Apostle Islands No.2(colors)
	.30	Sf 2	Apostle Islands No.1(colors)
	.20	Sf 8	Duluth and Superior Harbor (colors)
	.05	Sf 10	Agate and Burlington Bays (Two Harbors) (colors)

VESSELS OF THE REVENUE CUTTER SERVICE OF THE GREAT LAKES.

NAME	GUNS	Tons displacement	WHEN BUILT	WHERE BUILT	STATION
Tuscarora	1	670	1902	Richmond, Va....	Milwaukee, Wis.
Patrol....	....	12	1899	Jersey City, N. J.	Chicago, Ill.
Morrill...	1	397	1899	Wilmington, Del.	Detroit, Mich.
Mackinac.	....	220	1903	Baltimore, Md....	Sault Ste Marie, Mich.
Dallas....	2	370	1874	Portland, Me.....	Ogdensburg, N. Y.

ARRANGEMENTS OF BUOYS.

1. In approaching the channel, from seaward, red buoys, with even numbers, will be found on the starboard side of the channel, and must be left on the starboard hand in passing in.

2. In approaching the channel, from seaward, black buoys, with odd numbers, will be found on the port side of the channel, and must be left on the port hand in passing in.

3. Buoys painted with red and black horizontal stripes will be found on obstructions, with channel ways on either side of them, and may be left on either side in passing.

4. Buoys painted with red and black perpendicular stripes will be found in mid-channel, and must be passed close to to avoid danger. Nun buoys, properly colored and numbered, are usually placed on the starboard side, and can buoys on the port side of channels.

Definitions—

A nun buoy is a steel barrel with a cone shaped top.

A can buoy is a steel barrel with a flat top.

DRY DOCKS OF THE GREAT LAKES.

Buffalo—

Buffalo Dry Dock Co., 4 docks with lengths of 291, 347, 379, and 478 feet respectively.

Empire Shipbuilding Co., 2 floating docks with lengths of 100 and 125 feet respectively.

Cleveland—

American Shipbuilding Co., 3 docks with lengths of 360, 450, and 547 feet respectively.

Lorain—

American Shipbuilding Co., 1 dock, length 600 feet.

Sandusky—

Poulit Boat Co., 1 dock, length 130 feet.

Toledo—

Craig Shipbuilding Co., 1 dock, length 525 feet.

A. Gilmore, 1 dock, length 235 feet.

Toledo Marine Railway, length 100 feet.

Detroit—

Great Lakes Engineering Works, 1 floating dock, length 600 feet.

Detroit Shipbuilding Co., 2 docks, lengths 232 and 387 feet respectively.

Oades Marine Railway, length 186 feet.

Port Huron—

Port Huron Shipbuilding Co., 1 dock, length 412 feet.
Wolverine Dry Dock Co., 1 floating dock, length 208 feet.

Bay City—

Davidson Shipbuilding Co., 2 docks, lengths 435 and 315 feet.

Sault Ste Marie—

Hickler Bros. marine railway, length 190 feet.

Duluth—

Napoleon Grignon, 1 floating dock, length 60 feet.

Superior—

Superior Shipbuilding Co., 2 docks, lengths 514 and 620 feet.
Lake Superior Dredging Co., 1 floating dock, length 95 feet.

Sturgeon Bay—

Riebolt Wolter Co., 4 floating docks, lengths 100, 150, 170 and 215 feet.

Manitowoc—

Manitowoc Dry Dock Co., 1 dock, length 340 feet; 1 floating dock, length 120 feet.

Milwaukee—

Milwaukee Dry Dock Co., 2 docks lengths 320 and 455 feet., 3 floating docks, lengths 90, 130 and 200 feet.

Chicago—

Shipowners Dry Dock Co., 3 docks, lengths 180, 320 and 500 feet.

South Chicago—

Chicago Shipbuilding Co., 1 dock, length 564 feet.

Oswego—

Ontario Dry Dock Co., 1 dock, length 165 feet.

Ogdensburg—

St. Lawrence Marine Railway Co., 1 dock, length 300 feet.

CANADIAN DRY DOCKS.

Owen Sound—

Owen Sound Dry Dock Co., 1 dock, length 300 feet.

Collingwood—

Collingwood Shipbuilding Co., 1 dock, length 517 feet.

Port Dalhousie—

Muir Brothers, floating dock, length 300 feet.

Toronto—

Medler and Arnot, 1 dock, length 90 feet.

Kingston—

Kingston Dry Dock Co., 1 dock, length 180 feet.
Davis Dry Dock Co., 1 dock, length 180 feet.

Montreal—

Canada Marine Works, 2 docks, lengths 200 and 216 feet.

Quebec—

Davie and Sons, 2 docks, lengths 180 and 236 feet.
Ross and Co., 1 dock, length 322 feet.
The Russell Co., 1 dock, length 223 feet.

POPULATION OF LAKE CITIES, TOWNS AND VILLAGES.

(From the census of 1900)

Lake Ontario—North Shore.

Kingston	20,000	Port Hope	5,042
Bath	530	Newcastle	800
Belleville	10,000	Bowmanville	3,377
Trenton	4,364	Whitby	———
Deseronto	3,338	Toronto	188,911
Picton	3,287	Port Credit	600
Brighton	1,479	Oakville	2,000
Cobourg	4,829	Hamilton	50,000

Lake Ontario—South Shore.

Ogdensburg	12,633	Charlotte	1,400
Cape Vincent	1,310	Oak Orchard	107
Sacketts Harbor	1,266	Olcott	210
Oswego	22,199	Port Dalhousie	1,000
Fair Haven	610	Niagara Falls	19,450

Lake Erie—South Shore.

Buffalo	352,387	Lorain	16,028
Dunkirk	11,616	Vermillion	1,184
Erie	52,733	Huron	1,708
Conneaut	7,133	Sandusky	19,664
Ashtabula	12,949	Port Clinton	2,450
Fairport	2,073	Toledo	131,822
Cleveland	381,768	Monroe	5,043

Lake Erie—North Shore.

Port Colborne	1,700	Port Bruce	200
Port Maitland	70	Port Stanley	616
Port Dover	1,213	Rondeau	200
Port Ryerse	150	Leamington	1,910
Port Rowan	750	Kingsville	1,335
Port Burwell	700	Colchester	200

The Detroit and St. Clair Rivers—American Side.

Yyandotte	3,183	Marine City	3,829
Ecorse	479	St. Clair	2,543
Detroit	285,704	Marysville	307
Mount Clemens	6,576	Port Huron	19,158
Algonac	1,216		

The Detroit and St. Clair Rivers—Canadian Side.

Amherstburg	2,279	Sombra	400
Sandwich	1,352	Courtright	500
Windsor	11,452	Sarnia	6,693
Walkerville	1,110	Point Edwards	1,182
Port Lambton	350		

Lake Huron—West Shore.

Lakeport	100	Alabaster	309
Lexington	619	East Tawas	1,736
Port Sanilac	314	Au Sable	1,116
Richmondville	72	Oscoda	1,109
Forestville	282	Harrisville	403
Harbor Beach	1,149	Black River	456
Port Hope	319	Alpena	11,802
Huron	72	Rogers City	544
Grindstone City	426	Cheboygan	6,489
Port Austin	507	Mackinac City	564
Bay City	27,628	St. Ignace	2,271
Saginaw	42,325	Detour	880

Lake Huron—East Shore.

Southampton	1,437	Bayfield	600
Port Elgin	1,659	Port Franks	100
Kincardine	3,000	Point Edwards	1,182
Goderich	4,000		

Georgian Bay.

Tobermory	100	Byng Inlet	100
Wiarton	2,300	Killarney	250
Owen Sound	7,497	Little Current	850
Meaford	2,000	Gore Bay	800
Collingwood	5,400	Algoma Mills	500
Penetanguishene	2,110	Blind River	150
Midland	2,088	Thessalon	800
Victoria Harbor	300	Bruce Mines	375
Waubashene	1,000	Garden River	150
Parry Sound	2,200	Sault Ste Marie	3,000

Soo River.

Detour	880	Bay Mills	843
Sault Ste Marie (Mich.)	—	Emerson	107
Sault Ste Marie (Ont.)	3,000	Whitefish Point	125
Brimley	207		

Lake Michigan—East Shore.

Cross Village	531	Frankfort	1,465
Harbor Springs	1,643	S. Frankfort	639
Petoskey	5,285	Manistee	14,260
Charlevoix	2,079	Ludington	7,166
Boyne City	912	Pentwater	1,061
East Jordan	1,205	Muskegon	20,818
South Arm	307	Grand Haven	4,743
Elk Rapids	1,175	Saugatuck	707
Traverse City	9,407	South Haven	4,009
Old Mission	107	Benton Harbor	6,562
Good Harbor	186	St. Joseph	5,155
Northport	405	New Buffalo	629
Leland	396	Michigan City	14,850
Glen Haven	83		

Lake Michigan—West Shore.

Chicago	1,698,575	Marinette	16,195
Waukegan	9,426	Menominee	12,818
Kenosha	11,606	Cedar River	393
Racine	29,102	Ford River	516
Milwaukee	285,315	Escanaba	9,549
Port Washington	3,010	Wells	846
Sheboygan	22,962	Gladstone	3,380
Manitowoc	11,786	Rapid River	442
Two Rivers	3,784	Vans Harbor	207

Lake Michigan—West Shore.

Kewaunee	1,773	Nahma	378
Sturgeon Bay	3,372	Garden	465
Green Bay	18,684	Fayette	56
Depere	4,038	Thompson	368
Oconto	5,646	Manistique	4,126
Peshtigo	2,228	Naubinway	87

Lake Superior—South Shore.

Grand Marais	843	Hancock	4,050
Munising	2,014	Lake Linden	2,597
Marquette	10,058	S. Lake Linden	1,164
Pequaming	573	Ontonogan	1,267
L. 'Anse	620	Ashland	13,074
Baraga	1,185	Washburn	6,814
Copper Harbor	205	Bayfield	1,689
Eagle Harbor	107	Redcliff	51
Eagle River	112	Port Wing	257
Chassell	667	Superior	31,091
Dollar Bay	723	West Superior	26,176
Houghton	3,359		

Lake Superior—North Shore.

Duluth	52,969	Fort William	3,000
West Duluth	3,400	Port Arthur	3,000
Two Harbors	3,278	Nipigon	50
Grand Marais (Minn.)	298		

THE LAKE MICHIGAN WINTER STEAMBOAT LINES.

Milwaukee to Racine and Chicago.
Milwaukee to Grand Haven.
Milwaukee to Ludington.
Milwaukee to Sturgeon Bay Canal.
Manitowoc to Ludington.
Manitowoc to Frankfort.
Kewaunee to Frankfort.
Kewaunee to Ludington.
Frankfort to Manistique.
Ludington to Manistique.

SOME OF THE PROMINENT LANDMARKS OF LAKE SUPERIOR.

Point Au Sable sand hills, 400 feet high.
Pictured Rocks, 170 feet high.
Grand Island, 200 feet high.
Mount Mesnard, just south of Marquette, 522 feet high.
Ives Hill, just to westward of Big Bay point, 1030 feet high.
Mount Huron, just to eastward of Huron Islands, 930 feet high.
Huron Islands, 160 feet high.

Porcupine mountains, 1420 feet high.

Pie Island, 900 feet high.

Mount McKay, to the south westward of Fort William, 990 feet high.

Duluth, 560 feet high.

Thunder Cape, 800 feet high.

High land back of Thunder Cape, 1350 feet high.

Isle St. Ignace, north shore of Lake Superior, 1260 feet high.

Land back of Simmons Harbor, N. E. shore Lake Superior, 1520 feet high.

Michipocoten Island, 925 feet high.

Coppermine point, 16 miles N. E. from Whitefish point, 1350 feet high.

Rudder Head point, directly east from Whitefish point, 850 feet high.

Gros Cap, 400 feet high.

Point Iroquois high land, 400 feet high.

THE HEIGHTS OF SOME OF THE MOST PROMINENT LANDMARKS OF THE OCEAN.

Ailsa Craig, Scottish coast, 1098 feet high.
Gomera Island, 1440 feet high.
Cape of Good Hope, 800 feet high.
Cape Horn, 500 feet high.
South Foreland, 380 feet high.

THE CREW OF A MODERN LAKE STEEL FREIGHT STEAMER AND THEIR WAGES.

Master,	$240.00	per month
First Mate,	115.00	per month
Second Mate,	80.00	per month
Chief Engineer,	175.00	per month
First Assistant Engineer,	115.00	per month
Second Assistant Engineer,	80.00	per month
2 Oilers,	50.00	per month each
2 Wheelsmen,	50.00	per month each
2 Watchmen,	50.00	per month each
Steward,	86.00	per month

Second Cook,	34.00 per month
Porter,	30.00 per month
4 Firemen,	50.00 per month each
6 Seamen,	30.00 per month each

From October 1st until the close of navigation the wages for wheelmen, watchmen, firemen and oilers are increased to $65.00 per month, the wages of second cook are increased to $37.50, the porter gets $37.50 per month, and the seamen get $40.00.

Total number of crew, 25.

The above information was furnished by the manager of a boat of the class of the Augustus B. Wolvin.

THE CREW OF A MODERN OCEAN STEEL FREIGHT STEAMER AND THEIR WAGES.

Master,	$100.00 per month
First Mate,	50.00 per month
Second Mate,	35.00 per month
Chief Engineer,	85.00 per month
First Assistant Engineer,	60.00 per month
Second Assistant Engineer,	40.00 per month
Third Assistant Engineer,	30.00 per month
Donkeyman Engineer,	25.00 per month
Boatswain Engineer,	28.00 per month
Carpenter Engineer,	33.00 per month
Steward Engineer,	33.00 per month
Engineers Steward,	30.00 per month
Cook,	28.00 per month
Seven Firemen,	20.00 per month each
Eight Seamen,	20.00 per month each

Total number of crew, 28.

The above information was furnished by the North Atlantic S. S. Co. New York, N. Y.

GET THE CORRECT TIME.

Time balls that drop at the exact hour of noon are operated by the Hydrographic Office from the tops of the following buildings:

Buffalo—Postoffice building.
Cleveland—Arcade building.
Sault Ste Marie—News building.
Duluth—Torrey building.
Chicago—Postoffice building.

Things Worth Knowing

The registered tonnage of a vessel is the net tonnage.

A full loaded ship carries about twice its net registered tonnage.

Vessels less than five net tons require no license and are exempt from the laws regulating the coasting trade.

Vessels over twenty net tons are enrolled and licensed.

A boat in the water displaces water equal to its own weight.

Steamers are not allowed to run even one day on an expired certificate of inspection.

Vessels from five to twenty net tons are required to be licensed.

Steamers cannot be re-inspected by the Hull and Boiler inspectors more than thirty days previous to the expiration of their present certificates.

A boat that draws ten feet of water in fresh water will raise up two inches—to 9 feet 10 inches—on going into the salt water of the ocean.

Salt water first becomes noticeable thirty miles below Quebec.

The Americans built the St. Clair ship canal and afterwards discovered that it was in Canadian waters.

The Hay Lake cut was opened in 1894.

The Hay Lake cut shortened the route to the Soo about ten miles.

The first Soo canal was built on the Canadian side in 1797. The lock was 38 feet long and 8 feet wide and was destroyed by U. S. troops in 1814.

Previous to the year 1892 the head light of a steamer was carried higher than the stern light.

Previous to the year 1892 a lone steamer running in a fog blew one long blast of the steam whistle at intervals of not more than one minute. A steamer with a tow blew three whistles.

A greater tonnage annually passes Detroit than that which enters and clears in the Foreign trade of the Atlantic and Pacific coasts of the United States.

The Tonnage passing through the Soo canal by many times exceeds that of the Suez canal.

Taking the statistics of 1904 as a basis, of the total freight carried through the Soo, 94 per cent. was carried by American vessels and 6 per cent. by Canadian vessels.

The west bound freight at the Soo is only about one-fifth the amount of the east bound freight.

Fifty-four million tons of freight passes through the Detroit river each season.

During the eight months of the season of navigation on the lakes, five times more freight passes through the Detroit river than passes through the great Suez canal in twelve months.

During the season of navigation of 1905 the three locks at the Soo passed an average of 87 vessels a day. This record has never been approached by any ship canal in the world.

The combined area of the Great Lakes exceeds the combined area of England, Wales, and Scotland.

The coast line of the Great Lakes system borders upon nine states and these states contain more than one-third of the entire population of our country.

The six largest cities of the Great Lakes aggregate over three million population.

There are 1692 islands in the 'Lake-of-the-thousand-islands.'

There are over 30,000 islands in Georgian Bay.

There are twenty islands in the group at the west end of Lake Erie.

There are ten islands in the Beaver group in Lake Michigan.

There are twenty islands in the Apostle group in Lake Superior.

The largest island in the Great Lakes is Manitoulin island, at the head of Lake Huron. This island is eighty miles long and thirty miles wide at its place of greatest width.

The lift of the Welland canal is 326 feet.

The lift of the Soo canal is twenty feet at a normal stage of water.

The first American canal at the Soo used two tandem locks—each with a lift of 9 feet.

Previous to 1881 toll was charged at the Soo canal.

The American and Canadian canals at the Soo are now free.

The Canadians still charge toll at the Welland canal.

Toll is charged at the great Suez canal.

The Suez canal was built by the French but the British own a big share of the stock.

The rapids of the St. Clair river at Fort Gratiot are gradually getting deeper.

The Soo river discharges 72,000 cubic feet of water per second into Lake Huron.

The St. Clair river discharges 190,000 cubic feet of water per second into Lake St. Clair.

The Detroit river discharges 195,000 cubic feet per second into Lake Erie.

The Niagara river discharges 220,000 cubic feet per second into Lake Ontario.

The St. Lawrence river discharges 220,000 cubic feet per second into the Gulf of St. Lawrence.

Nine Mile point, in Hay Lake, is so called because it is nine miles from the Soo.

Six Mile point, in Hay Lake, is so called because it is six miles from the Soo.

The United States mines annually nearly three hundred million tons of soft coal and eighty million tons of hard coal.

Bituminous coal is soft coal; Anthracite coal is hard coal.

The average value, at the mine, of the soft coal is $1.18 per ton, and hard coal, $2.10.

There are 194,000 square miles of coal fields in the United States.

Iron ore is sold and freighted down the lakes by the long ton—2,240 lbs.

Coal goes at the short ton of 2,000 pounds.

The state of Ohio yields twelve million tons of soft coal annually, and her supply is estimated to last for two hundred years.

Within the memory of living men the Niagara Falls have receded 110 feet.

Lake Superior was first opened to navigation in 1855.

The Canadian locks at the Soo were opened in 1895.

Long Point, Lake Erie, is an island.

From the west end of Lake Erie eastward as far as the west end of Long Point there is no greater depth than 14 fathoms.

$4,500,000 worth of fish are taken from the Great Lakes annually.

The first Welland canal had 39 locks and was not cut through to Lake Erie. This canal led into the Welland river; from there, vessels passed into the Niagara river just below Grand Island and then came up the Niagara river to Lake Erie.

In 1817 a treaty was made between the United States and England. This treaty provides that the naval forces to be maintained on the Great Lakes shall be confined on each side to one vessed on Lake Ontario, one on Lake Champlain, and two vessels on the upper lakes. These vessels are limited to 100 tons burden and an armament of one 18 pounder cannon. However this treaty has not always been lived up to, especially by the Americans. The American ship, Tuscarora, measures 670 tons.

In 1860 it took ten days to cross the Atlantic; in 1880, 7 days; in 1890, 6 days; and in 1903 the time was reduced to 5½ days.

New York is the second greatest seaport in the world. In 1903 over 9,000,000 tons of imports and 8,700,000 tons of exports were cleared through New York harbor. London, England, is the greatest seaport, exceeding New York in imports though not in exports. Antwerp and Hamburg are third and fourth respectively.

A modern steel ocean freight steamer of about 6,000 tons carrying capacity, carries a crew of 28 and her monthly wages expense is about $850.00. A steel lake freighter of the same size would carry a crew of 23 and her monthly wages expense would be $1,500.00.

Salt water ice floats in salt water with one-ninth of its mass above water.

Fresh water ice floats in fresh water with one-tenth of its mass above water.

An ocean steamer, when under way in a fog, blows one blast of a steam whistle at intervals of not more than two minutes.

A lake steamer, when under way in a fog, must blow three blasts of the steam whistle at intervals of not more than one minute.

Fog signals for sailing vessels are the same for both lake and ocean.

A revolving light at Baccalieu, Newfoundland, can be seen 40 miles in clear weather.

Some of the best lights on the lakes are frequently seen from the bridge of a big steamer at a distance of 25 miles.

A fixed white lake light of the fourth order, in a tower 50 feet high, should be seen, in clear weather, from the deck of a steamer, at a distance of about 15 miles. A fixed red light of the same power and of the same height, should be seen under the same conditions, about 12 miles.

There are no "First Order" lights on the lakes.

Gas buoys are filled with compressed illuminating gas under a pressure of from 150 to 180 pounds to the square inch. The light burns night and day. They burn for several months without refilling. There are no fixed lights on the American Gas buoys. They are all flashing. Some of the Canadian gas buoys have fixed lights.

The weather bureau says that the Portage is the best route in time of a fog as there is generally less fog there than around Keweenaw point.

The heights of mountains and other objects can be approximately determined by the use of the barometer. The hand will fall about one-tenth in an ascent of 100 feet.

The pressure of air decreases as we go aloft.

Persons who have made their declaration of intention to become citizens of the United States, and who serve three years thereafter as a sailor in the merchant marine of the United States, are admitted to citizenship without longer residence.

The statute mile is the one most commonly used on the Great Lakes.

A statute mile is 5,280 feet; a nautical mile is 6,080 feet.

Seven nautical miles are equal (appromixately) to eight statute miles.

Red spars have even numbers; black spars have odd numbers; striped spars have no numbers.

A nun buoy is cone shaped; a can buoy is flat on top.

The Northern Lights are called the Aurora Borealis; the Southern Lights are called the Aurora Australis.

A. M. means ante-meridian or before meridian—the hours from midnight to noon.

P. M. means post meridian or after meridian—the hours from noon to midnight.

Apparent time is sun time.

Tidewater is reached at Three Rivers, about midway between Montreal and Quebec.

Spring tide rises 18½ feet at Quebec.

A boat coming from Montreal to Lake Superior passes through 47 locks and is lifted 550 feet.

From Lake Erie to Montreal the draft of water is limited to 14 feet.

From Montreal, eastward, to the ocean, there is water enough for deep draft, ocean going vessels to navigate.

Icebergs have been frequently reported in the Antarctic ocean that were 1,000 feet from water line to summit. As salt water ice floats with one-ninth of its mass above water there would be 8,000 feet of these bergs below the water.

Figures have been given that show that freight can be carried 1,000 miles by water at a less price than the same freight can be carried 100 miles by rail.

The rule forbidding an upbound tow to meet a down bound tow at Johnston's point, in the Soo river, has been abolished.

In a trip from the Soo to Duluth it is 3 miles farther via the Portage.

A ton of soft coal contains 2,000 cubic feet of gas, 1,500 pounds of coke, 20 gallons of ammonia water, and 14 pounds of coal tar.

Sound travels in dry air at 82 degrees 1,141 feet per second, in water 4,900 feet per second, in iron 17,500 feet per second, in copper 10,378 feet per second, in wood 12,000 to 16,000 feet per second.

To find the area of a cylinder multiply the diameter by the diameter and the result by .7854.

The first Buffalo grain cargo was 3,000 bushels brought from the upper lakes on the brig 'John Kenzie' 1836.

Lake freight steamers are now carrying as high as 380,000 bushels of wheat at one cargo.

To furnish wheat enough to load one of these big steamers, would require the product from 15,200 acres of land, at a yield of 25 bushels to the acre. This would be equal to 24 square miles, or two-thirds of a whole township.

The greatest depth of water on the Great Lakes is 1,008 feet, this depth being found on Lake Superior.

The greatest known depth of water in the world is found in the Pacific ocean and is nearly five statute miles.

The largest steamers in the world are the new Cunard liners that have just been launched. Their length is 790 feet and their beam is 88 feet.

The greatest depth ever reached by a diver has just been attained by a French naval engineer who dived 1,000 feet to examine a French sunken vessel. He found that darkness commences below 200 feet and below 350 feet there was pitchy blackness.

When signaling for a life saving crew the stars and stripes should be put bottom side up.

The name of the town of Ahnapee has been changed to Algoma Harbor.

There are green lights at three Canadian ports—Goderich and Saugeen on Lake Huron and Pikering on Lake Ontario. There are no green lights on the American side.

When it is foggy on the lake off Detour and clear inside the river, the whistle blows one long and one short blast. When it is foggy both inside and outside the whistle blows one long blast.

Going into Sturgeon Bay, from Lake Michigan, the red buoys will be found on the left hand side and the black buoys on the right hand side. The channel is buoyed, beginning from the Green Bay end.

Deviation ranges, for the correction of compass errors have been placed, by the government, on Pipe Island Twins, at Sweet's point, and near old Point Mackinac. The range on Pipe Island Twins is east and west, magnetic, the ranges at Sweet's point are S. W., magnetic, and south 6 degrees and 30 minutes west, magnetic, respectively; and the range at old Point Mackinac is S. W. magnetic.

There is a shoal spot almost in the middle of Lake Huron, with fairly good holding ground. The depth is 6 fathoms. It bears S. E. by E. ¼ E. 37 miles from Thunder Bay Island light.

There is also a shoal spot in Lake Superior, bearing N. E. ¼ E., 4 miles from Stannard Rock light. The depth is 7 fathoms, clay bottom.

The most northerly port on the Great Lakes is Nipigon, Ont.

The most southerly port on the Great Lakes is Huron, Ohio.

The most westerly port on the Great Lakes is Duluth, Minn.

The most easterly port on the Great Lakes is Sackett's Harbor, N. Y.

Section 854 of the ordinances of the city of Cleveland provides that when a funeral procession is crossing a drawbridge no answering signal, either by whistle or bell, shall be given by the bridge-tender, to a signal from any boat to open the draw, until such funeral procession shall have crossed over.

Down bound boats have the right of way when it is apparent that two boats will meet at the Superior Street Viaduct, at Cleveland.

There are 69 drawbridges across the Chicago river and its branches.

There are 30 drawbridges across the rivers at Milwaukee.

There are 21 drawbridges across the Cleveland rivers.

The Canadians close all their St. Lawrence river canals on Sunday excepting the Galops lift lock.

There are four bridges across the St. Lawrence river.

The proposed Canadian canal to connect Georgian Bay with Lake Ontario will be 200 miles long, of which less than 20 miles will be actual canal, a chain of small lakes and rivers being utilized for the balance of the channel.

The two largest cargos of lumber ever carried down the lakes were shipped on the barge, 'Wahnapitae,' in 1887. The first load was 2,181,000 feet and the next load was 2,409,800 feet, both loads being put aboard at Duluth and unloaded at Tonawanda. The Wahnapitae was 275 feet long and 51 feet beam. Her deckload was 22 feet high and she drew 11 feet of water. She was owned by the Saginaw Lumber Company and the Emery Lumber Company and was built to carry logs from Georgian Bay to the Saginaw river. She was wrecked in Georgian Bay in 1888.

The Egytians had vessels large enough to be called ships 3,000 years B. C.

Mariners compass came into general use in the 13th century.

Charts first published in the year 1537 in Portugal.

Quadrant invented in England, 1730.

A boat 90 feet long, 15 feet beam and drawing 4 feet can go from Toledo to Cincinnati, through the Miama canal. The distance is 245 miles. From Toledo to Dayton the depth is 5 feet.

A Canadian vessel cannot enter Lake Michigan without permission from a United States Collector of Customs.

An American vessel, coming from a Canadian port to an American port cannot put off or take on cargo without having first reported to the United States Collector of Customs.

'Notices to Mariners' are sent out, free of charge, by both the American and Canadian governments. Bearings are 'True' in the American notices, and 'Magnetic' in the Canadian notices. Distances nautical and statute miles in the American notices, and in nautical miles in the Canadian notices.

Small light draft boats can get from the Great Lakes into the Mississippi river by two different routes, viz: via Chicago and the Illinois canal, or via Green Bay and the Fox river. Both of these routes are described on another page.

The 1906 record for fast unloading of iron ore was 9,500 tons in 4½ hours, at Conneaut.

4,000 tons of hard coal were unloaded in 10 hours at Duluth in 1906.

Buoys are now set in Lake Erie to mark the boundry line between United States and Canada. This was made necessary by the fishery disputes.

The east breakwater at Cleveland is being extended two miles.

There is talk of making Chicago a seaport by connecting the drainage canal with the Mississippi river.

The tug Champion was the first steamer on the lakes to be equipped with a fore-and-aft compound engine.

Two and one-half million tons of fuel used on the Great Lakes every season.

Tonawanda receives nearly 500,000,000 feet of lumber every season.

A steel steam light ship is being built by the government for Southeast Shoal.

Steamboat island, in the Apostle group, Lake Superior, has disappeared, the action of the waves having worn it away.

Pie island, Lake Superior, should not be confounded with Pic island. Both are on the north shore.

There are two Manitou islands on Lake Superior, one near Keweenaw point and the other in the Apostle group.

The first steamer on the lakes was built at Buffalo in 1818 (described on another page).

The first steamer to cross the Atlantic was the auxiliary steamer 'Savannah' in the year 1819, sailing from New York to Liverpool in 31 days, using both sails and steam. This steamer measured 300 tons.

The first steamer built of iron was the 'Aaron Manby' built in England in 1821.

Steel was first used in shipbuilding in 1879.

The first steamers carried a pressure of from five to seven pounds on their boilers.

The feathering paddlewheel was patented in 1829 by Elijah Galloway.

The screw propeller was first used in 1837.

Experiments with steam boats first began in 1707. Denis Papin experimented with a paddle wheel steamboat on the river Fulda.

In 1736 Jonathan Hull also experimented with a paddlewheel steamer.

Several others experimented along the same lines but the first practical steamer was the tugboat 'Charlotte Dundas' built in 1802.

Compound engines were introduced into steamboats in 1870.

The government inspection of marine boilers first began in England in 1817.

Vessels first began to be reckoned by tons in the 16th century.

There are noon bridge hours at Racine and Kenosha.

Vesselmen are agitating the cutting of a central canal across the point into the harbor at Duluth.

The lowest water at the Lime-kiln Crossing is generally found in April and November and the highest water is generally found during July.

The 'Lake-of-the-Thousand Islands' is that part of the St. Lawrence river beginning at Lake Ontario and extending eastward for about fifty miles. This part of the river contains 1,692 islands.

Waterspouts are sometimes seen on the Great Lakes.

The highest recorded waves on the Great Lakes were eighteen feet.

Over 200 streams flow into Lake Superior.

Tidal waves are sometimes met with on the lakes, especially on Lake Michigan. In 1893 a tidal wave, four feet high, occurred on Lake Michigan, doing considerable damage at Chicago and at other towns on the west shore.

The greatest speed ever attained by any boat was thirty-seven miles an hour, by the yacht 'Ellide.'

Transfer of an American vessel to foreigners prohibits it from ever again sailing under the American flag.

The first war vessel of any size was built by Henry VII in the 15th century. The name of this ship was the "Great Henry." The wages paid to sailors in the English navy at this time was: Commander of a fleet, 10 shillings a day; captains, 1 shilling and sixpence a day; sailors, 5 shillings a month.

Lake shipyards built and launched 41 vessels in 1902, 50 vessels in 1903, 13 vessels in 1904, 32 vessels in 1905, and 49 vessels in 1906. And these vessels were nearly all leviathan steel freighters.

There are about 2,500 vessels doing business on the Great Lakes.

Waters of the ocean belong to a country just a marine league from shore; beyond this the ocean belongs to all nations alike.

The schooner George C. Finney was struck by a waterspout on Lake Erie, in 1889. Her spars were carried away and she was almost wrecked. Her crew escaped.

Niagara Falls ran almost dry for one day in 1837 on account of an ice jam in the Niagara river at Buffalo.

During the Canadian rebellion of 1837 the American steamer Caroline was cut loose from Schlossers dock, just above Niagara Falls, by a party of Canadians, and after being set on fire she was sent over the falls. This was done to prevent her from carrying supplies across the river to the rebels.

During the season of 1866 freight rates on wheat from Chicago to Buffalo ranged from twelve to twenty three cents a bushel. The previous year (1865) rates were from six to nineteen cents.

The passenger steamer "Lady Elgin" was lost on Lake Michigan in 1860. Nearly three hundred lives were lost.

During the season of 1865 there were about 25 tugs engaged in the business of towing vessels through the rivers.

BEARINGS OF PIERS, BREAKWALLS, ETC.

The following courses and bearings of piers are given with the idea that they may be useful for entering unfamiliar ports and harbors at night. The courses are corrected for variation and will lead safely in from seaward.

The pier lights for the ports of the Great Lakes are generally placed on the right hand pier, going in. The only exceptions to this rule are as follows, where you will find the pier light on the left hand:

LAKE SUPERIOR—

Duluth, Superior.

LAKE MICHIGAN—

Charlevoix, Portage, Lake Harbor, Manistee, Waukegan, St. Joseph.

LAKE HURON—

Kincardine, Goderich.

LAKE ERIE—

Fairport, Port Stanley.

Lake Erie.

BUFFALO—

Bearing of pier E. ¾ S. Main breakwater SE. by S. ½ S.

Flashing white light on south pier, fixed red light on north end of main breakwater.

DUNKIRK—

Through dredged channel from lake—SE. by S. ¾ S. heading on red light on west pier; then steer E. by S. ⅞ S. along face of east breakwater and into harbor.

ERIE—

Steer in between piers SW. by W. ⅞ W. Range lights on N. pier.

CONNEAUT—

S. ⅞ E. clears breakwater and leads in between piers.

Range lights on west pier.

ASHTABULA—

S. ½ W. clears outer cribs and leads in between piers.

Fixed red light on west crib and fixed red light on W. pier.

FAIRPORT—

Steer in between piers due south. Range lights on east pier.

CLEVELAND—

SE. by S. ½ S. takes you between outer crib lights, through breakwater entrance and in between piers.

Main light, flashing red and white, on west side of breakwater entrance, fixed red opposite.

LORAIN—

Steer in between piers SE. ¼ S. Range lights on west pier.

VERMILLION—

Steer in between piers due south. Red light on west pier.

HURON—

Steer in between piers SE. ¼ S. White light on west pier.

SANDUSKY BAY—

Steer in from lake and through outer channel SW. by W., then through inner channel to B. & O. docks, S. by W. ⅝ W.

KELLEY'S ISLAND DOCKS—

South stone loading docks—steer in due north. Two fixed white lights on end of dock, one over the other.

West stone loading dock. Steer in safely on any course between east and E. S. E. Red light on end of dock.

North stone loading dock. Steer in due west. White light on end of dock.

PORT CLINTON—

Steer S. SW. in between piers. Red light on west pier.

TOLEDO—

In through dredged channel—SW. by W. ¼ W. Range lights in mid channel and are passed on either side.

MUNROE—

Best water (10 feet) is found by heading in in line with the outer section of north pier, course W. NW. Fixed red light on north pier.

RONDEAU—

Steer in between piers N. by E. ½ E. Lighthouse on east breakwater pier.

PORT COLBORNE—

N. by E. ½ E. takes you clear of breakwater and into harbor. Fixed white light on west side. Fixed red on east side.

Lake Huron.

ALPENA—

Steer in river NW. ¼ W. Fixed red light on north side.

CHEBOYGAN—

Steer in past crib and into river SW. by S. ¼ S.

FALSE DETOUR PASSAGE—

Get passage to bear NE. ¾ N. and steer in and through on this course.

STRAITS OF MISSISSAGI—

Approach the passage with light bearing anywhere between NE. by N. and N. by W. Good course through is N. by E. Light on east side.

KINCARDINE—

Steer in from lake and between piers E. by S. ¾ S. Red light on north pier.

GODERICH—

Steer in E. ⅛ S. on red ranges passing breakwater red light on port side until 700 feet from front pier light, when steer in piers E. by S ⅛ S. Light on north pier.

ALGOMA MILLS—

Best water found by steering in on dock N. by W.

Lake Superior.

GRAND MARAIS—

Steer in between piers S. ⅜ E. Red range on west pier.

MARQUETTE—

Breakwater runs due north and south. Fixed red light on south end.

PRESQUE ISLE ORE DOCKS—

NW. ⅝ N. heading on red dock lights.

PRESQUE ISLE LUMBER DOCKS—

Steer in NW. by W.

PORTAGE ENTRY—

Steer in along pier N. by W. Red light on south end of pier. One pier only—on east side.

PORTAGE LAKE SHIP CANAL—

Steer in between breakwaters and into canal SE. by S. ½ S. Flashing red lights on both sides of breakwater entrance; lighthouse on west pier.

ONTONAGON—

Steer in between piers SE. by S. Fixed red light on west pier.

SUPERIOR—

Steer in between piers SW. ⅛ W. Lights on south pier.

DULUTH—

Steer in between piers SW. by W. ⅛ W. Lights on south pier.

Lake Michigan.

CHARLEVOIX—

Steer in between SE. by E. ¼ E. Red light on north pier.

FRANKFORT—

Steer in between piers E. ¼ S. Red range lights on S. pier.

PORTAGE LAKE HARBOR—

Steer in between piers E. ⅜ S. Red range lights on north pier.

MANISTEE—

Steer in between piers SE. by E. ⅝ E. Range lights on north pier.

LUDINGTON—

Steer in between piers E. ⅛ S. Red range on south pier, and red light on north pier.

PENTWATER—

Steer in between piers E. by S. ¾ S. Red range on S. pier.

WHITE RIVER—

Steer in between piers due east. Range lights on S. pier.

MUSKEGON—

Steer in between piers NE. by E. ¼ E. Range lights on south pier.

GRAND HAVEN—

Steer in between piers E. by N. Lighthouse on south pier.

HOLLAND—

Steer in between piers E. ¼ N. Red range lights on S. pier.

KALAMAZOO—

Steer in between piers E. ¾ N. Fixed red light on outer end of south pier.

SOUTH HAVEN—

Steer in between piers E. ¾ N. Fixed red light on outer end of south pier.

ST. JOSEPH—

Steer in between piers E. by S. ⅜ S. Red range lights on north pier.

SOUTH CHICAGO—

Steer in between piers SW. by W. ¼ W.

CHICAGO—

Steer in between piers due west. Range on north pier.

WAUKEGAN—

Steer in between piers due west. Main light on south pier.

KENOSHA—

W. ½ S. takes you to southward of breakwater and between piers. Fixed red light on breakwater and on north pier.

RACINE—

W. ¾ S. takes you to southward of breakwater and between piers. Fixed red light on breakwater and on north pier. By ranging these lights you pass to northward of Racine reef.

MILWAUKEE—

Steer in between piers W. ½ S. Red range on north pier.

SHEBOYGAN—

W. ¼ S. takes you to southward of breakwater and in between piers. Red light on end of breakwater and red light on north pier.

MANITOWOC—

W. ¾ S. takes you to southward of breakwater and in between piers. Red light on end of breakwater and red light on north pier.

TWO RIVERS—

Steer in between piers NW. by N. Red light on north pier.

KEWAUNEE—

Steer in between piers W. by N. ⅞ N. Red range on N. pier.

AHNAPEE (Algoma)—

Steer in between piers NW. ¼ W. Red range lights on north pier.

STURGEON BAY SHIP CANAL—

Steer in from Lake Michigan NW. ¼ W., passing through breakwater entrance and between piers. Red light on north breakwater and white light on north pier.

MENOMINEE—

Steer in between piers SW. by W. ¼ W. Red light on north pier.

Lake Ontario.

OSWEGO—

SE. by S. ¾ S. clears breakwater on starboard hand side and takes you in between piers. White light on W. pier.

FAIR HAVEN—

Steer in between piers S. ¼ W. White lights on west pier.

BIG SODUS BAY—

Steer in between piers S. by W. ⅜ W.

THE LENGTH OF YOUR TRIP.

BUFFALO TO—

Cleveland,	175 miles
Detroit	258 miles
Port Huron	320 miles
Sault Ste Marie	590 miles
Marquette	745 miles
Ashland	935 miles
Two Harbors	960 miles
Duluth	980 miles
Fort William	860 miles
Escanaba	690 miles
Green Bay	760 miles
Milwaukee	820 miles
Chicago	885 miles
Collingwood	580 miles
Owen Sound	560 miles

CLEVELAND TO—

Buffalo	175 miles
Detroit	105 miles
Port Huron	165 miles
Sault Ste Marie	440 miles
Marquette	555 miles
Ashland	785 miles
Two Harbors	810 miles
Duluth	830 miles
Fort William	710 miles
Escanaba	540 miles
Green Bay	610 miles
Milwaukee	665 miles
Chicago	730 miles
Collingwood	430 miles
Owen Sound	410 miles

THE SOO TO—

Marquette	160 miles
Hancock and Houghton	225 miles
Fort William	270 miles
Duluth	395 miles
Michipicoten	120 miles
Ashland	340 miles
Port Huron	270 miles
Detroit	330 miles
Cleveland	440 miles
Buffalo	590 miles
Escanaba	220 miles
Mackinac	90 miles
Green Bay	290 miles
Milwaukee	345 miles
Chicago	415 miles

A FEW HANDY DISTANCES

Buffalo to Bar Point	234 miles
Bar Point to Ft. Gratiot (Through Rivers)	87 miles
Fort Gratiot to Detour	220 miles
Fort Gratiot to Mackinac	242 miles
Detour to Whitefish Point	90 miles
Whitefish Point to Duluth	352 miles
Mackinac to Chicago	320 miles

RIVER DISTANCES.

St. Clair River.

BAR POINT TO—

Fort Gratiot	87 miles
Bois Blanc	6 miles
Detroit (Woodward Avenue)	24 miles
St. Clair Flats Ship Canal (Lower light)	47 miles

BOIS BLANC TO—

Detroit	18 miles
Fort Gratiot	81 miles
Lime Kilns to Detroit	16 miles
Grassy Island to Detroit	8½ miles

DETROIT TO—

Grosse Point Light Vessel	14 miles
St. Clair Flats Ship Canal (Lower Light)	23 miles
Port Huron	61 miles
Windmill Point to Grosse Point Light Ship	7¼ miles
Grosse Point Light Ship to St. Clair Flats Canal (lower)	9½ miles

CANAL (UPPER LIGHT) TO—

Marine City	18 miles
St. Clair	25½ miles
Port Huron	37 miles
Fort Gratiot	39 miles

PORT HURON TO—

St. Clair	11 miles
Marine City	18½ miles
Algonac	26 miles
St. Clair Flats Canal (Upper Light)	37 miles
Detroit	61 miles
Bar Point	85 miles

Soo River.

DETOUR TO—

Soo Canal	50 miles
Sailors Encampment	27 miles
Point Iroquois	64 miles
Whitefish Point	90 miles

SOO CANAL TO—

Point Iroquois	14 miles
Whitefish Point	40 miles
Sailors Encampment	22 miles
Detour	50 miles
Six Mile Point	6 miles
Nine Mile Point	9 miles

Through the Portage.

From Portage Entry to Portage Canal	25 miles

DISTANCES BY DIFFERENT ROUTES.

LAKE SUPERIOR.

Whitefish Point to Duluth around Keweenaw point	352 miles
Whitefish Point to Duluth through the Portage	355 miles
Whitefish Point to Duluth following north shore	425 miles
Whitefish Point to Duluth following south shore and through Portage	390 miles

LAKE HURON.

Fort Gratiot to Thunder Bay, regular course	146 miles
Fort Gratiot to Thunder Bay, following west shore	154 miles

LAKE MICHIGAN.

Mackinac Point to Milwaukee, by Point Betsey	257 miles
Mackinac Point to Milwaukee, by 'north about'	280 miles
Mackinac Point to Chicago, by Point Betsey	323 miles
Mackinac Point to Chicago, by 'north about'	350 miles
Mackinac Point to Chicago, following north and west shore	360 miles

LAKE ERIE.

Bar Point to Buffalo, regular course	234 miles
Bar Point to Buffalo, following north shore	255 miles
Bar Point to Buffalo, following south shore	265 miles

BOAT CREWS AND FIRE STATIONS.

Laws Governing Fire and Boat Drill.

Section 5, Rule 50, rules and regulations prescribed by the Board of Supervising Inspectors, January, 1905.

It shall be the duty of the officer in charge of every steamer carrying passengers to cause to be prepared a station bill for his own department, and one also for the engineer's department, in which shall be assigned a post or station of duty for every person employed on board such steamer in case of fire or other disaster; which station bills shall be placed in the most conspicuous places on board for the observation of the crew. And it shall be the duty of such master, or mate or officer next in command, once at least in each week, to call all hands to quarters and exercise them in the discipline, and in the unlashing and swinging out of the lifeboats, weather permitting, and in the use of fire pumps and all other apparatus for the safety of life on board such vessel, with especial regard for the drill of the crew in the method of adjusting the life-preservers and educating passengers and others in this procedure, and to see that all the equipments required by law are in complete working order for immediate use; and the fact of the exercise of the crew, as herein contemplated, shall be entered upon the steamer's log book, stating the day of the month and hour when so exercised; and it shall be the duty of the inspectors to require the officers and crew of all vessels to perform the aforesaid drills and discipline in the presence of the said inspectors at intervals sufficiently frequent to assure the said inspectors by actual observation that the foregoing requirements of this section are complied with; the master shall also report monthly to the local inspectors the day and date of such exercise and drill, the condition of the vessel and her equipment, and also the number of passengers carried, and any neglect or omission on the part of the officer in command of such steamer to strictly enforce this rule shall be deemed cause for the suspension or revocation of the license of such officer. Three copies of this section shall be furnished every steamer carrying passengers, to be framed under glass and posted in conspicuous places about the vessel.

Rules and Regulations To Be Strictly Observed In Training For Cases of Emergency.

No boats to be lowered without orders from the captain. Chiefs of boats, after they are manned, will attend to the embarking, the passengers—women and children first, then men—and the balance of the crew and the ship's company; they will see that their respective boats contained at all times all the equipment required by law, and that they get in the full number of life preservers assigned to their boats and only a corresponding number of persons on board unless otherwise ordered by the captain.

Upon the discovery of fire notify the officer in charge at the pilot house.

Man overboard: Throw out life preservers and notify the officer in charge at the pilot house. The captain or officer in charge will designate who shall man the life raft in case of emergency.

FIRE AND BOAT DRILL.

No uniform style of Station Bill has been adopted for use on lake steamers but the form used below is the one in general use by the boats of the Lake Carriers Association.

Fire Alarm.

Ten strokes of bell—General alarm.
One stroke of bell—Attention
Three strokes of bell—Fire forward.
Four strokes of bell—Fire amidships.
Five strokes of bell—Fire aft.
Two strokes of bell—Man life boats.
One stroke of bell—Lower boats.

Same signal to be given engineer on electric bell.

Big steam whistle can be used in giving alarm instead of bell.

Station of crew in case of fire or accident: Captain in general charge. Chief engineer in charge of engine. Assistant engineer in charge of pumps. Steward in charge of life-preservers, buckets, axes, etc.

Forward Deck Fire Pump.	**After Deck Fire Pump.**
First Mate in charge	Second Mate in charge
2nd Watch Wheelsman	1st Watch Wheelsman
2nd Watch Watchman	1st Watch Watchman
2nd Watch Oiler	1st Watch Oiler
2nd Watch Coal-Passers	1st Watch Coal-Passers
2nd Deck Watch	1st Deck Watch
2nd Watch Fireman	1st Watch Firemen
Porter	2nd Steward

If wheelsman on duty to remain at wheel. If fireman on duty to remain in fire hold. If oiler on duty to remain in the engine room.

No one to leave his post until order by captain.

No life boats must be lowered without captain's order or proper signal.

Officers in charge will see that the respective boats are properly equipped with life-preservers, provisions, etc.

Crew Boat No. 1.	**Crew Boat No. 2.**
First Mate in charge	Second Mate in charge
2nd Watch Wheelsman	Chief Engineer
2nd Watch Watchman	1st Watch Wheelsman
2nd Engineer	1st Watch Watchman
2nd Watch Oiler	3rd Engineer
2nd Watch Firemen	1st Watch Oiler
2nd Watch Coal-Passers	1st Watch Firemen
2nd Deck Watch	1st Watch Coal-Passers
1st Steward	1st Deck Watch
Porter	2nd Steward

If any passengers on board captain will assign them to boats.

If steamer carries more than two boats captain should assign crew for third boat and life-raft.

SAILING DISTANCES ON THE ST. LAWRENCE RIVER, LAKE ONTARIO, AND WELLAND CANAL.

	Ogdensburg	Cape Vincent	Kingston	Oswego	Fair Haven	Big Sodus	Charlotte	Oak Orchard	Thirty-mile Point	Olcott	Niagara	Port Dalhousie	Presque Isle	Port Hope	Whitby	Toronto	Oakville	Hamilton	Port Colborne
Montreal	136	196	201	245	254	264	283	303	316	329	349	359	271	299	330	359	370	383	387
Ogdensburg		60	65	109	118	128	147	167	180	193	213	223	135	163	194	223	234	247	251
Cape Vincent			24	48	58	68	87	107	120	133	153	163	75	103	134	163	174	187	191
Kingston				55	64	71	88	108	121	134	154	164	76	104	135	164	175	188	192
Oswego					14	27	57	85	99	112	135	145	68	93	123	148	158	170	173
Fairhaven						15	47	75	90	103	125	135	65	88	116	138	149	160	163
Big Sodus							33	63	77	92	112	123	60	78	105	126	136	149	151
Charlotte								35	48	62	82	92	49	57	78	98	107	119	120
Oak Orchard									15	29	50	61	49	39	48	65	75	86	89
Thirty-mile Point										13	34	44	58	40	38	50	59	70	72
Olcott											20	32	68	46	35	40	47	59	60
Niagara												16	87	62	40	31	33	42	44
Port Dalhousie													98	71	46	30	25	31	28
Presque Isle														33	65	95	108	121	126
Port Hope															35	65	78	92	99
Whitby																32	46	61	74
Toronto																	18	33	58
Oakville																		16	53
Hamilton																			59
Port Colborne																			0

SAILING DISTANCES ON LAKE ERIE, ETC., FROM BUFFALO TO FORT GRATIOT.

	Port Colborne	Dunkirk	Long Point	Erie	Ashtabula	Port Stanley	Fairport	Rondeau	Cleveland	Black River	Pelee Spit	Sandusky	Bar Point	Monroe	Toledo	Detroit	Ft. Gratiot Light
Buffalo	20	35	64	80	117	124	145	162	173	194	198	220	232	240	255	256	321
Port Colborne		26	48	66	103	108	129	146	157	178	182	204	215	224	239	240	305
Dunkirk			36	45	84	96	111	133	140	162	168	188	202	210	225	226	291
Long Point				27	57	60	82	98	110	131	134	155	168	176	191	192	257
Erie					43	71	73	99	101	124	132	150	165	174	187	187	252
Ashtabula						55	26	63	56	78	88	105	121	130	145	146	211
Port Stanley							61	45	83	94	85	112	118	127	142	143	208
Fairport								47	30	51	63	78	97	105	120	121	186
Rondeau									52	55	40	67	74	82	97	98	163
Cleveland										25	47	53	81	89	102	105	170
Black River											30	29	63	72	78	88	153
Pelee Spit												28	33½	42	57	58	123
Sandusky													47	46	57	69	134
Bar Point														13	32	24	89
Monroe															21	36	101
Toledo																56	121
Detroit																	65
Fort Gratiot Light																	0

SAILING DISTANCES FROM BUFFALO TO POINTS ON LAKE ERIE AND THE UPPER LAKES.

	Port Colborne	Erie	Ashtabula	Cleveland	Black River	Sandusky	Toledo	Detroit	Fort Gratiot	Saginaw River	Cheboygan	Old Ft. Mackinac	Escanaba	Milwaukee	Chicago	Michigan City	Sault Ste. Marie	Marquette	L'Anse	Houghton	Ashland	Two Harbors	Duluth	Port Arthur
Buffalo	20	80	117	173	194	220	255	256	321	463	551	567	695	825	890	893	602	760	818	820	949	973	996	874
Port Colborne	...	66	103	157	178	204	239	240	305	452	535	551	679	809	874	877	586	744	802	806	933	957	980	858
Erie	...	...	43	101	124	150	187	187	252	399	482	498	626	756	821	824	533	691	749	753	880	904	927	805
Ashtabula	...	...	...	56	78	105	145	146	211	358	441	457	585	715	780	783	492	650	708	712	839	863	886	762
Cleveland	...	...	...	...	25	53	102	105	170	312	400	416	544	674	739	742	451	609	667	670	798	822	845	723
Black River	...	...	...	...	...	29	78	88	153	300	383	399	527	657	822	725	434	592	650	654	781	805	828	706
Sandusky	...	...	...	...	...	...	57	69	134	281	364	380	508	638	703	706	415	573	631	635	762	786	809	687
Toledo	...	...	...	...	...	...	...	56	121	268	351	367	495	625	690	693	402	560	618	622	749	773	796	674
Detroit	...	...	...	...	...	...	...	...	65	212	295	311	439	569	634	637	346	504	562	566	693	717	740	618
Fort Gratiot	...	...	...	...	...	...	...	...	...	147	230	246	374	504	569	572	281	439	497	501	628	652	675	553
Saginaw River	...	...	...	...	...	...	...	...	...	...	188	203	331	465	526	529	238	396	454	458	585	609	632	510
Cheboygan	...	...	...	...	...	...	...	...	...	...	...	17	145	275	340	345	91	249	307	311	438	462	485	363
Old Fort Mackinac	...	...	...	...	...	...	...	...	...	...	...	...	128	258	323	326	103	261	319	323	450	474	497	375
Escanaba	...	...	...	...	...	...	...	...	...	...	...	...	...	201	274	287	231	389	247	451	578	602	625	503
Milwaukee	...	...	...	...	...	...	...	...	...	...	...	...	...	...	83	104	361	519	577	581	708	732	755	633
Chicago	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38	426	584	642	646	773	797	820	698
Michigan City	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	429	587	645	649	776	800	823	701
Sault Ste. Marie	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	158	216	220	347	371	394	272
Marquette	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	76	*80	*211	*236	*259	172
L'Anse	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*28	*160	*185	*207	*148
Houghton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*130	*155	*178	*117
Ashland	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	72	94	169
Two Harbors	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26	173
Duluth	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	197
Port Arthur	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0

*Via Portage Lake.

SAILING DISTANCES ON LAKE MICHIGAN AND GREEN BAY.

	Waugoshance	Escanaba	Green Bay	Grand Traverse	Frankfort	Manistee	Ludington	White Lake	Muskegon	Grand Haven	St. Joseph	Michigan City	Sturgeon Bay Ship Canal	Manitowoc	Sheboygan	Port Washington	Milwaukee	Racine	Kenosha	Waukegan	Chicago
Old Fort Mackinac	18	128	198	95	121	147	171	211	222	235	299	326	148	194	214	237	258	270	280	295	323
Waugoshance		109	179	77	103	129	153	193	204	217	279	308	130	176	196	219	240	252	262	277	305
Escanaba			102	120	91	112	130	171	182	195	255	287	76	126	149	175	201	218	229	245	274
Green Bay				171	*105	*113	*123	*160	*171	*183	*242	*265	* 51	*106	*129	*155	*180	*197	*208	*226	*256
Grand Traverse					92	118	142	182	193	206	270	299	127	166	184	207	230	243	253	268	295
Frankfort						27	51	92	104	117	180	208	54	80	96	119	140	154	164	179	204
Manistee							24	67	77	90	154	182	61	66	77	97	116	128	138	153	178
Ludington								43	54	67	130	158	73	60	64	81	97	108	118	132	157
White Lake									11	24	88	118	109	79	69	73	78	82	89	101	120
Muskegon										13	79	109	120	89	77	78	80	81	87	97	114
Grand Haven											67	99	132	100	87	84	83	81	86	94	108
St. Joseph												35	192	151	130	113	96	79	75	70	60
Michigan City													215	170	147	126	104	83	76	64	38
Sturgeon Bay Ship Canal														55	77	104	129	147	157	173	206
Manitowoc															25	52	76	96	106	122	155
Sheboygan																28	52	71	82	98	131
Port Washington																	26	46	57	73	106
Milwaukee																		23	34	50	83
Racine																			10	27	60
Kenosha																				17	50
Waukegan																					36
Chicago																					0

*Via Sturgeon Bay Ship Canal.

SAILING DISTANCES ON LAKE HURON, ETC., FROM FORT GRATIOT TO OLD FORT MACKINAC.

	Port Sanilac	Sand Beach	Pt. aux Barques	Saginaw River	Tawas	Au Sable	Alpena	Thunder Bay Id.	Cheboygan Light	Goderich	Kincardine	Southampton	Cove Island Lt.	Owen Sound	Collingwood	Detour Light	Sault Ste. Marie	Old Ft. Mackinac
Fort Gratiot	30	60	75	144	117	114	154	147	230	63	91	119	167	246	264	221	281	246
Port Sanilac	....	30	45	117	87	83	124	117	200	47	68	96	140	219	236	191	251	216
Sand Beach	....	....	15	87	57	53	94	88	170	47	54	78	114	193	211	161	221	186
Point aux Barques	....	....	....	72	42	39	79	73	155	55	55	75	104	183	201	146	206	172
Saginaw River	....	....	....	....	46	60	109	104	188	127	125	142	158	237	255	178	238	203
Tawas	....	....	....	....	....	18	57	64	146	97	93	108	117	196	214	138	198	163
Au Sable	....	....	....	....	....	....	48	45	127	93	85	96	101	180	198	119	179	144
Alpena	....	....	....	....	....	....	....	15	97	125	107	107	87	166	184	89	149	114
Thunder Bay Island	....	....	....	....	....	....	....	....	82	115	96	94	72	151	169	74	134	99
Cheboygan Light	....	....	....	....	....	....	....	....	....	196	176	171	132	211	229	31	91	17
Goderich	....	....	....	....	....	....	....	....	....	....	34	62	114	193	211	187	247	213
Kincardine	....	....	....	....	....	....	....	....	....	....	....	29	84	163	181	166	226	193
Southampton	....	....	....	....	....	....	....	....	....	....	....	....	64	143	161	158	218	188
Cove Island Light	....	....	....	....	....	....	....	....	....	....	....	....	....	79	97	116	176	149
Owen Sound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	49	195	255	228
Collingwood	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	213	273	246
Detour Light	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	60	43
Sault Ste Marie	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	103
Old Fort Mackinac	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0

SAILING DISTANCES ON LAKE SUPERIOR.

	White Fish Point	Gd. Marais, Mich.	Marquette	L'Anse	Portage Entry	Copper Harbor	Eagle Harbor	Portage Lake Ship-Canal	Ontonagon	Bayfield	Ashland	Port Arthur	Gd. Marais, Minn.	Two Harbors	Duluth
Sault Ste. Marie	41	90	158	216	207	187	202	231	271	336	347	272	305	371	394
White Fish Point		49	117	175	166	146	161	190	231	295	306	231	264	330	353
Grand Marais, Mich.			68	129	120	106	121	149	191	256	267	199	224	289	313
Marquette				76	67	75	90	*90	*132	*200	*211	172	*178	*236	*259
L'Anse					15	71	86	*38	*81	*148	*160	*148	*126	*185	*207
Portage Fntry						60	75	*23	*66	*133	*144	*130	*111	*169	192
Copper Harbor							15	44	85	149	161	100	117	184	207
Eagle Harbor								28	70	134	145	97	103	169	192
Portage Lake Ship-Canal									43	110	121	108	87	146	169
Ontonagon										74	83	121	76	115	137
Bayfield											16	154	75	56	78
Ashland												169	89	72	94
Port Arthur													94	173	197
Grand Marias, Minn														81	106
Two Harbors															26
Duluth															0

*Via Portage Lake.

RUNNING THE RIVERS BY COURSES AND THE DISTANCES ON EACH COURSE.

The following courses are corrected for variation:

The Detroit River.

Bar Point over stern, Bois Blanc over bow, N. by E.—3½ miles.

Then on Amherstburg ranges, N. by E. ⅜ E.—2¾ miles.

Then on Elliot point ranges, past Amherstburg, N. ½ W.—1⅓ miles.

Then Bois Blanc range over stern, N. NE.—⅓ miles.

Then through Lime Kiln Crossing, due north—½ mile.

Then Malden range over stern, N. by W. ½ W.—4 miles.

Then to Mamajuda island, with Grosse Isle over stern, N. by E. ⅛ E.—1⅛ miles.

Then on Grassy island range, N. ⅛ E.—1 mile.

Then Mamajuda range over stern, N. ⅞ E.—1¼ miles.

Then Ecorse range over bow, N. ⅛ W.—1 mile.

Then straight course to Sandwich, NE. by N. ½ N.—4¾ miles.

Then course abreast Detroit, E. by N. ½ N.—3 miles.

Then course abreast Belle Isle, E. by N. ¼ N.—2¼ miles.

Then on Windwill Point ranges, NE.—1¼ miles.

Then past Windmill point and up to Grosse point channel, E. NE. ⅛ E.—2⅛ miles.

Then through Grosse point cut, NE. ½ E.—6 miles.

Then across Lake St. Clair to entrance Gas buoys, NE. ¼ E.—8⅓ miles.

Then through St. Clair ship canal, NE. ⅛ N.

The St. Clair River.

Leaving canal, steer NE. ½ N.—1 mile, then N. ½ E.—1 mile.

The river then gradually bends until the course is SE., then swings back until the course is NE. by N. ½ N., heading on Herson's island ranges.

Then Herson's island range over stern, NE. by E. ½ E.—½ mile.

Russell island range over bow, NE.—1¾ miles.

Course abreast Russell island, NE. ¾ N.

Then across Lake St. Clair to entrance Gas buoys, NE. ¼ E.—8⅓ miles.

Course abreast Port Lambton, N. ¼ E.—1 mile.

Then Port Lambton to Marine City, N. by E. 3¼ E.—3¼ miles.

Passing Marine City, N. by E. ¾ E.

Marine City to Recor point, N. by E. ¾ E.—2¾ miles.

The river then runs in a N. by W. direction to St. Clair.

Courtright to Mooretown, N. by E. ½ E.—1½ miles.

Mooretown to foot of Stag island, N. by E.—2½ miles.

Corunna ranges over stern, N. by W.—1⅛ miles.

From head of Stag island to South Park, N. by E. ¾ E.—2¼ miles.

South Park to abreast oil refinery at Sarnia, NE.—2½ miles.

From abreast ferry dock at Sarnia to abreast Port Huron waterworks, NE. by N. ½ N.—1¼ miles.

With Fort Gratiot ranges over stern, NE. by N.—1 mile.

With Point Edward ranges over stern, N. ¼ E.—1½ miles to lightship.

The Soo River.

On range, Frying Pan and Pipe island, N. ⅛ W.

From abreast Point Detour to Frying Pan, N. ⅜ E.—2⅛ miles.

Then N. ¾ W.—1⅝ miles.

From Pipe island to Sweet's point, NW. ¾ N.—2⅞ miles.

From Sweet's point to Lime Island turn, NW. by W. ⅛ W.—4½ miles.

From Lime island to Point Aux Frenes, N. ⅜ E.—4⅜ miles.

From Point Aux Frenes to Mud lake crib, NW.—6¾ miles.

Pilot island range, leading up to Encampment, N. by E. ¾ E.—4 miles.

From Johnston's point to Dark Hole, NW. ¼ N.—1 mile.

Dark Hole range, leading up through Little Mud lake, N. ⅛ W.—3 miles.

Stribling Point range, through dyke, NW. by W. ⅝ W.—3 1-5 miles.

Lower Hay lake range, from dyke to Nine-mile point, NW. by N. ¾ N. 5½ miles.

Middle Hay lake range, from Nine-mile point to Six-mile point, N. by W. ½ W.—2½ miles.

Fretchett point range, NW. by N.—1½ miles.

Up through island cut, N. NW. ⅛ W.—3 miles.

Bayfield Rock range,—leading to the Soo, W. NW. ⅛ W.—1¾ miles.

Vidal shoal range, from canal to Big point, W. by S.—2¼ miles.

Point Aux Pins range, Big point to Brush point, SW. by W.—2¼ miles.

Brush point to Point Aux Pins, SW ½ S.—1 mile.

St. Mary's river lower range (red), W. by S. ¼ S.—2¾ miles.

St. Mary's river upper range (white), NW. by W. ¼ W.—1 mile.

Head of St. Mary's river range to Point Iroquois, NW. ½ N.—4 miles.

COURSES AND DISTANCES CORRECTED FOR MAGNETIC VARIATION.

Lake Ontario.

Port Dalhousie to—

False Ducks, N. ½ E.—4 miles, then E. by N. ¼ N.—131 miles.
Gibraltar point, N. by W.—27 miles.
Burlington Bay, W. by N. ½ N.—27 miles.
Oswego, E. by N. ⅜ N.—29 miles, then E. ¼ S.—111 miles.

Gibraltar Point to—

Port Dalhousie, S. by E.—27 miles.
Big Sodus point, E. by S. ⅜ S.—123 miles.
Charlotte, E. by S.—83 miles; then SE. ½ E.—10 miles.
Oak Orchard, E. by S. ½ S.—61½ miles.
Sackett's Harbor, E, 152 miles.
Oswego, E. by S.—142 miles.

Oswego to—

Toronto, W. by N.—142 miles.
Coburg, NW. by W. ½ W.—87½ miles.
Nine-mile point, N. ½ E.—46½ miles.
Stony point, NE. by N. ¼ N.—30 miles.

Lake Erie.

Buffalo to—

Long Point, W. by S. ¾ S.—63¾ miles.
Dunkirk, SW. ⅛ W.—34½ miles.
Erie, SW. ¾ W.—76½ miles.
Ashtabula, SW. by W. ¼ W.—117 miles.
Fairport, SW. by W. ½ W.—144 miles.
Cleveland, SW. by W. ½ W. to Fairport; then SW. ½ W.—29 miles.
Lorain, SW. by W. ¾ W.—194 miles.
Huron, SW. by W. ⅞ W.—212 miles.
Sandusky, SW. by W. ⅞ W.—215 miles.
South Passage, W. SW.—215 miles.
Middle Passage, W. by S. ¾ S.—209 miles.

Southeast Shoal Lightship to—

Sandusky, SW. by S. ½ S.—23¾ miles.
Huron, S. ¾ W.—28 miles.
Vermillion, S. by E.—26 miles.
Lorain, SE. by S. ¼ S.—27 miles.
Cleveland, SE. by E. ½ E.—44 miles.

Fairport, E. ¼ S.—62 miles.
Ashtabula, E. ¼ N.—88 miles.
Conneaut, E. ⅜ N.—100 miles.
Erie, E. ¾ N.—125 miles.
Dunkirk, E. by N. ¼ N.—167 miles.
Long Point, E. by N. ⅝ N.—134 miles.
Pellee passage, Middle ground light, NW. ¾ W.—6½ miles.

Pellee Passage to—

Southesat Shoal lightship, SE. ¾ E.—6½ miles.
Bar point, W. by N. ⅝ N.—30 miles.
West Sister Island, W. by S. ¼ S.—29 miles.

Cleveland to—

Long Point, NE. ½ E. to Fairport—29 miles; then NE. ¾ E.—84 miles.
Fairport, NE. ½ E.—29 miles.
Buffalo, NE. ½ E.—29 miles; then NE. by E. ½ E.—144 miles.
Port Colborne, NE. ½ E.—29 miles; then NE. by E.—127 miles.
Rondeau, N. by W.—51 miles.
Port Stanley, N. by E. ⅞ E.—82 miles.
Southeast Shoal lightship, NW. by W. ½ W.—44 miles.
South passage, W. ¼ N.—51 miles.
Middle passage, W. by N. ¼ N.—51 miles.

Long Point to—

Port Colborne, NE. by E. ⅝ E.—47 miles.
Buffalo, E. by N. ¾ N.—63¾ miles.
Erie, S. ¼ W.—24 miles.
Fairport, SW. ¾ W.—83 miles.
Cleveland, SW. ¾ W. to Fairport—83 miles; then SW. ½ W.—29 miles.
Rondeau, W. ⅞ S.—98 miles.
Middle passage, W. SW.—146½ miles.
South passage, SW. by W. ⅞ W.—151 miles.
Sandusky, SW. by W. ¾ W.—152 miles.

Bar Point to—

Pellee passage, E. by S. ⅝ S.—30 miles.
Green Island, SE by S. ½ S.—29 miles.
Toledo, SW. by S. ⅛ S.—19 miles.
Munroe, SW. ½ W.—11¼ miles.

Lake Huron.

Lake Huron Lightship to—

Harbor Beach, N. ⅝ W.—58½ miles.
Goderich, NE. ¾ N.—60 miles.
Point Clark, NE. by N. ¾ N.—77½ miles.
Cove Island, N. by E. ¼ E.—160¼ miles.
Great Duck Island, N. ½ W.—180 miles.

Harbor Beach to—

Point Aux Barques, NW. by N. ⅞ N.—15 miles.
Thunder Bay Island, N. by W. ½ W.—87½ miles.
Alpena, NW. by N. ⅞ N.—93 miles.
Mississagi Straits, N. by W.—145 miles.
Goderich, E. by S.—46 miles.
Kincardine, NE. by E. ⅞ E.—52 miles.
Cove Island, NE. by N. ¼ N.—111 miles.

Point Aux Barques to—

Au Sable, NW. ⅛ W.—38 miles.
Sable Point, NW. ½ W.—33 miles.
Tawas, NW. by W.—9 miles; then W. by N. ⅝ N.—30¼ miles.
Harrisville, NW. by N. ⅜ N.—50½ miles.
Thunder Bay Island, N. by W. ⅜ W.—72 miles.
Charity Island, NW. by W.—9 miles; then W. ½ S.—30 miles.
Goderich, SE. by E. ¾ E.—53 miles.
Cove Island, NE. by N. ½ N.—100 miles.
Sturgeon Point.—NW. by N. ½ N.—53 miles.

Charity Island to—

Saginaw river, SW. by S.—33 miles.
Tawas, North—12¾ miles.
Sable Point, NE. by N.—18 miles.
Port Austin, E. ½ N.—30 miles.
Cove Island, NE.—120 miles.

Sable Point to—

Thunder Bay island, N. ¾ E.—52 miles.
Charity Island, SW. by S.—18 miles.
Point Aux Barques, SE. ½ E.—33 miles.
Cove Island, NE. ⅜ E.—100 miles.

Thunder Bay Island to—

Presque Isle, NW. by N. ¾ N.—26½ miles.
Mississagi Strait, N. ¼ W.—58½ miles.
False Detour, N. by W. ⅜ W.—62 miles.

Cove Island, E. by N. ¼ N.—73 miles.
Sturgeon Point, S. by W.—22½ miles.
Sable Point, S. ¾ W.—52 miles.
Point Aux Barques, S. by E. ⅜ E.—72 miles.

Presque Isle to—
Detour, NW. by N. ⅛ N.—45 miles.
Poe Reef lightship, NW. by W. ⅝ W.—47 miles.
False Detour, N. ½ W.—37 miles.
Mississagi Strait, N. by E. ½ E.—36 miles.
Cove Island, E. ⅜ S.—83 miles.

Detour to—
Presque Isle, SE. by S. ⅛ S.—45 miles.
Mackinac, W. by S. ½ S.—26¾ miles; then W.—9½ miles.
Cove Island, SE. ⅞ E.—55 miles; then E. by S. ¼ S.—56½ miles.

Lake Superior.

Iroquois Point to—
Whitefish point, NW. ¾ N.—25 miles.

Whitefish Point to—
Copper Harbor, W. by N. ⅝ N.—145½ miles.
Passage Island, NW. by W. ⅜ W.—187 miles.
Sable Point, W. ½ S.—56¾ miles.
Marquette, W. ½ S.—56¾ miles; then W. by S. ¼ S.—60 miles.
Huron Island, W. ¼ N.—145 miles.
Portage Entry, W. ¼ N.—145 miles; then W. ½ S.—20 miles.
Nipigon Bay, NW. ⅛ N.—183 miles.
Cariboo Island, NW. ½ W.—55½ miles.
Michipicoten Island, NW. by N.—74 miles.
Michipicoten Harbor, N. ¾ W.—57 miles; then NE. by N. ½ N.—25 miles.

Marquette to—
Gull Rock, NW. by W. ¾ W.—57½ miles.
Stannard Rock, N. ⅜ E.—44 miles.
Portage Entry, N. ¼ W.—4½ miles to Presque Isle; then NW. ¼ N.—22 miles to Big Bay point; then W. NW.—18 miles, to Huron islands; then W. ½ S.—20 miles to Portage Entry.

Copper Harbor to—
Passage Island, NW. by N. ⅜ N.—55 miles.

Eagle Harbor to—
Devil's Island, W. by S. ½ S.—124 miles.
La Point, SW. by W. ½ W.—135 miles.
Passage Island, N. by W. ¼ W.—53 miles.
Two Harbors, W. by S. ½ S.—168 miles.

Portage Lake Ship Canal to—

Devil's Island, W. by S.—98½ miles.
La Point, SW. by W. ¾ W.—108 miles.
Ontonagon, SW. ⅜ W,—41½ miles.
Passage Island—N. ⅝ E.—68 miles.
Rock of Ages.—NW. ¼ N.—54 miles.

Devil's Island to—

Duluth, SW. by W. ½ W.—68 miles.
Superior, SW. by W.—66 miles.
Two Harbors, W. by S. ½ S.—45 miles.

Lake Michigan.

Mackinac Point to—

Waugoshance, W.—18½ miles.
Squaw Island, W. ½ N.—21 miles; then W. ¼ N.—22 miles.

Waugoshance to—

North Manitou, SW. ⅝ S.—65½ miles.

North Manitou to—

Point Betsey, SW. ½ S.—30 miles.

Point Betsey to—

Manitowoc, SW. ¾ W.—75 miles.
Sheboygan, SW. ⅛ S.—94 miles.
Milwaukee, SW. by S. ⅜ S.—139 miles.
Chicago, S. by W. ¼ W.—207 miles.

South Fox Island to—

Sturgeon Bay canal, SW. by W. ¼ W.—82 miles.
Death's Door, W. ¾ S.—52½ miles.

Beaver Island to—

Poverty island, W. ½ S.—55 miles.
Rock Island, W. ¾ S.—61½ miles.
Death's Door, W. by S. ¾ S.—68 miles.

Squaw Island to—

Poverty Island, SW. by W. ½ W.—58 miles.
Rock Island, SW. by W. ¼ W.—64 miles.
Manistique, W. ½ N.—32 miles.

Death's Door to—

Chicago, S. ⅜ W.—238 miles.
Milwaukee, S. by W. ⅛ W.—160 miles.
Twin River Point, S. by W. ⅝ W.—76 miles.
Escanaba, N. ½ W.—30 miles.

LIFE SAVING STATIONS ON THE GREAT LAKES.

Lake Ontario.

American Stations.

Big Sandy.
Oswego.
Charlotte.
Niagara.

Canadian Stations.

Wellington.
Cobourg.
Consecon.
Port Hope.
Toronto.

Lake Erie.

American Stations.

Buffalo.
Erie.
Ashtabula.
Fairport.
Cleveland.
Marblehead.

Canadian Stations.

West end Long Point.
Port Stanley.
Point Pellee.

Lake Huron.

American Stations.

Lake View Beach.
Harbor Beach.
Point Aux Barques.
Port Austin.
Tawas.
Sturgeon Bay.
Thunder Bay Island.
Middle Island.
Hammond.
Bois Blanc Island.

Canadian Stations.

Goderich.

Lake Superior.

American Stations.

Vermillion Point.
Crisp Point.
Two Heart River.
Deer Park.
Grand Marais, Mich.
Marquette.
Portage.
Duluth.

Lake Michigan.

American Stations.

Beaver Island.
Charlevoix.
North Manitou Island.
South Manitou Island.
Sleeping Bear Point.
Point Betsey.
Frankfort.
Manistee.
Grand Pt. Au Sable.
Ludington.
Pentwater.
White River.
Muskegon.
Grand Haven.
Holland.
South Haven.
St. Joseph.
Michigan City.
South Chicago.
Jackson Park.
Old Chicago.
Evanston.
Kenosha.
Racine.
Milwaukee.
Sheboygan.
Two Rivers.
Kewaunee.
Sturgeon Bay.
Bailey's Harbor.
Plum Island.

FOG WHISTLES ON THE GREAT LAKES.

Lake Ontario.

American Stations.

Tibbetts Point.
Galloo Island.
Genesee.

Canadian Stations.

Nine Mile Point.
False Ducks.
Point Peter.
Niagara.
Toronto.

Lake Erie.

American Stations.

Buffalo.
South Buffalo.
Presque Isle.
Ashtabula.
Cleveland.
South East Shoal.
Toledo.
Bar Point.
Par Point Lightship.

Canadian Stations.

Port Colborne.
Long Point.
Pellee Passage.

Lake Huron.

American Stations.

Fort Gratiot.
Lightship No. 61.
Harbor Beach.
Port Austin.
Tawas.
Thunder Bay Island.
Middle Island.
Presque Isle.
Forty Mile Point.
Spectacle Reef.
Cheboygan.
Round Island.
Old Mackinac.
Detour.
Poe Reef Lightship.

Canadian Stations.

Goderich.
Kincardine.
Cove Island.
Great Duck Island.
Mississagi Strait

Georgian Bay.

Canadian Stations.

Cabot Head.
Cape Croker.
Western Islands.

Lake Superior.

American Stations.

Point Iroquois.
Whitefish Point.
Crisp Point.
Big Sable Point.
Marquette.
Big Bay Point.
Stannard Rock.
Huron Island.
Manitou Island.
Eagle Harbor.
Portage Canal.
Fourteen Mile Point.
Outer Island.
La Pointe.
Raspberry Island.
Devil's Island.
Superior.
Duluth.
Two Harbors.
Passage Island.

Canadian Stations.

Cariboo Island.
Thunder Cape.

Lake Michigan.

American Stations.

Waugoshance Island.
White Shoal.
Gray's Reef.
Skilligallee.
Beaver Island.
South Fox Island.
Grand Traverse.
North Manitou.
South Manitou.
Point Betsey.
Frankfort.
Manistee.
Ludington.
Muskegon.
Grand Haven.
St. Joseph.
Michigan City.
Calumet.
Chicago.
Grosse Point.
Kenosha.
Racine Point.
Milwaukee.
Sheboygan.
Manitowoc.
Twin River Point.
Kewaunee.
Sturgeon Bay Canal.
Pilot Island.
Plum Island.
St. Martins Island.
Poverty Island.
Seul Choix Point.
Squaw Island.
Lansing Shoal.

Green Bay.

American Stations.

Eleven Foot Shoal.
Menominee.

LIGHT HOUSES, RANGE LIGHTS, PIER LIGHTS, GAS BUOYS, ETC., OF THE GREAT LAKES AND TRIBUTARIES.

Definitions.

Fixed.—A continuous steady light.

Flashing.—Showing single flashes.

Fixed and Flashing.—Main body of light shows continuously while brighter flashes revolve around it.

Revolving.—Light gradually increasing to full effect, then decreasing to eclipse.

Occulting.—A steady light suddenly and totally eclipsed. Occulting lights are generally put on gas buoys.

Alternating.—Red and white alternating at equal intervals.

Lights on Lake Ontario.

SACKETTS HARBOR—Fixed white.

GALLOO ISLAND—Fixed white.

STONY POINT—Fixed white varied by a white flash every 60 seconds.

OSWEGO BREAKWATER—Fixed red.

FAIR HAVEN—Fixed white.

BIG SODUS OUTER LIGHT—Fixed white with white flash every 30 seconds.

BIG SODUS INNER LIGHT—Fixed red.

GENESEE—West pier—Fixed red.

GENESEE—East pier—Fixed red.

BRADDOCK POINT—Fixed white.

OAK ORCHARD—Fixed white.

THIRTY MILE POINT—Flashing white every 45 seconds.

OLCOTT—Fixed white.

FORT NIAGARA—Fixed white.

Lights on Lake Ontario—Canadian Shore.

KINGSTON—Fixed white.

SNAKE ISLAND—Fixed red.

NINE MILE POINT—Fixed white.

PIGEON ISLAND—Revolving white.

FALSE DUCKS—Fixed white.

SOUTH BAY POINT—Fixed red.

POINT PETER—Revolving white.

SALMON POINT—Fixed red.

EGG ISLAND—Fixed white.

WELLER BAY RANGE—Front range, white. Back range, red.

PRESQUILLE—Fixed white.

COBOURG—East pier—Fixed white.

COBOURG—West pier—Fixed red.

PETER ROCK—Fixed white.

PORT HOPE—Fixed white.

NEW CASTLE—Fixed white.

DARLINGTON—Fixed white.

OSHAWA—Fixed white.

WHITBY—Fixed white.

PICKERING—Fixed Green.

TORONTO—Fixed red.

TORONTO—East pier range—Front, flashing red. Back, fixed red.

GIBRALTAR POINT—Revolving white.

PORT CREDIT—Fixed white.

OAKVILLE—Fixed white.

BURLINGTON BAY MAIN LIGHT—Fixed white.

BURLINGTON BAY RANGE—Front, fixed white. Back, red over white.

PORT DALHOUISE MAIN LIGHT—Occulting white.

PORT DALHOUISE PIER—Fixed white.

NIAGARA-ON-THE-LAKE—Range—Two red lights.

Gas Buoys on Lake Ontario—American.

EAST CHARITY SHOAL GAS BUOY—Fixed white 10 seconds; eclipse 10 seconds.

GALLOO ISLAND GAS BUOY—White 10 seconds; eclipse 10 seconds.

Gas Buoys on Lake Ontario—Canadian.

MIDDLE GROUND GAS BUOY—Fixed white.

Lighthouses, Etc., on Lake Erie—American.

HORSESHOE REEF—Fixed white varied by white flash every 30 seconds.

BUFFALO MAIN LIGHT—Flashing white every 5 seconds.

BUFFALO BREAKWATER—North end—Fixed red.

BUFFALO BREAKWATER—South entrance—North side, fixed red. South side, flashing red and white.

BUFFALO NORTH BREAKWATER—South end—Fixed red.

DUNKIRK—Fixed white varied by a white flash every 45 seconds.

DUNKIRK WEST PIER—Fixed red.

ERIE—North pier—Fixed red.

ERIE—Range No. 1 and 2.—Fixed white.

PRESQUILLE—Flashing red and white.

CONNEAUT—Fixed white, on west pier.

CONNEAUT RANGE—Front, fixed white on west pier; back, fixed red.

ASHTABULA RANGE—Front, fixed red on end of west breakwater; back fixed red on west pier.

FAIRPORT MAIN LIGHT—Fixed white—on bluff, east side of river.

FAIRPORT RANGE—Front—Fixed white—on east pier. Back—Fixed red—on east pier.

CLEVELAND MAIN LIGHT—Flashing red and white—east end of west breakwater.

CLEVELAND BREAKWATER—Fixed red—on west end of east breakwater.

CLEVELAND EAST PIER—Fixed red.

CLEVELAND WEST PIER—Fixed white.

LORAIN RANGE—Front—Fixed white—on west pier. Back—Fixed red—on west pier.

VERMILLION—Fixed red—on west pier.

HURON—Fixed white—on west pier.

SANDUSKY BAY INNER RANGE—Front—Fixed red—on crib in bay. Back—Fixed red on crib in bay.

SANDUSKY BAY OUTER RANGE—Front—Fixed white—on crib in bay. Back—Fixed white—on crib in bay.

MARBLEHEAD—Flashing white every 10 seconds—on Marblehead point.

SOUTH BASS ISLAND—Fixed red—on south end of island.

GREEN ISLAND—Flashing red and white every 30 seconds.

PORT CLINTON—Fixed red—on west pier.

WEST SISTER ISLAND—Fixed white.

TOLEDO HARBOR LIGHT—One red and two white flashes—on outer crib.

MAUMEE BAY EASTERLY AND WESTERLY RANGES—All fixed white.

MANHATTAN RANGE—Front—Fixed red. Back—Fixed red—on Manhattan point.

MUNROE—Fixed red—on north pier.

SOUTH EAST SHOAL LIGHTSHIP—Fixed white.

BAR POINT—Fixed white for one minute followed next minute by six white flashes.

BAR POINT LIGHTSHIP—Fixed white.

Lighthouses on Lake Erie—Canadian.

PORT COLBORNE—Front range—Fixed white—main light. Back range—fixed red.

PORT COLBORNE BREAKWATER—Fixed red temporarily.

MOHAWK ISLAND—Revolving white.

PORT MAITLAND—Fixed white—on west pier.

PORT DOVER RANGE—Front—Fixed white. Back—Fixed red—both lights on west pier.

LONG POINT—Revolving white every minute.

WEST END LONG POINT—Revolving red every minute.

PORT BURWELL—Fixed white.

PORT STANLEY—Fixed white—on west pier.

RONDEAU HARBOR RANGE—Front—Fixed white—on east pier. Back (main light) alternating red and white.

PELLEE PASSAGE—Flashing white—on the middle ground.

PELLEE ISLAND—Fixed white.

MIDDLE ISLAND—Fixed red.

LEAMINGTON—Fixed white—on shore near pier.

KINGSVILLE—Fixed red ranges on east pier.

COLCHESTER REEF—Fixed white.

Gas Buoys on Lake Erie—American.

WAVERLY SHOAL—Fixed white 10 seconds, eclipse 10 seconds.

SENECA SHOAL—Fixed white 10 seconds, eclipse 10 seconds.

ERIE HARBOR OUTER GAS BUOY—Fixed white 10 seconds, eclipse 10 seconds.

ERIE HARBOR INNER GAS BUOY—Fixed white 10 seconds, eclipse 10 seconds.

SANDUSKY BAY OUTER GAS BUOY—Fixed white 10 seconds, eclipse 10 seconds.

GULL ISLAND SHOAL—Fixed white 10 seconds, eclipse 10 seconds.

PEACH ORCHARD POINT—Fixed white 10 seconds, eclipse 10 seconds.

KELLEY'S ISLAND SHOAL—Fixed white 10 seconds, eclipse 10 seconds.

STARVE ISLAND REEF—Fixed white 10 seconds, eclipse 10 seconds.

NIAGARA REEF—Fixed white 10 seconds, eclipse 10 seconds.

MAUMEE OUTER GAS BUOY—Fixed white 10 seconds, eclipse 10 seconds.

MAUMEE INNER GAS BUOY—Fixed white 10 seconds, eclipse 10 seconds.

Gas Buoys on Lake Erie—Canadian.

PORT COLBORNE—Occulting white.

GRUBB REEF—Occulting white—in Pigeon Bay.

BAR POINT—Fixed white.

Lighthouses in the Detroit River.

BOIS BLANC ISLAND—Fixed white.

AMHERSTBURG RANGE—Front—Fixed red. Back—Fixed red.

ELLIOT POINT RANGE—Two fixed red lights.

HEAD OF BOIS BLANC ISLAND RANGE—Front—Fixed white. Back—Fixed red.

TEXAS DOCK RANGE—Front—Fixed red. Back—Fixed white.

LIME KILN CROSSING SOUTH LIGHTSHIP—Fixed white.

LIME KILN CROSSING NORTH LIGHTSHIP—Fixed white.

FORT MALDEN RANGE—Front—Fixed white. Back—Fixed red.

GROSSE ISLE SOUTH CHANNEL RANGE—Two fixed red lights.

GROSSE ISLE NORTH CHANNEL RANGE—Two F. W. lights.

GRASSY ISLAND RANGE—Two fixed white lights.

MAMAJUDA ISLAND—Two fixed red lights.

ECORSE RANGE—Two fixed red lights.

GRASSY ISLAND NORTH CHANNEL RANGE—Two fixed red lights.

BELLE ISLE—Fixed red.

WINDMILL POINT—Main light—Fixed white varied by red flash.

WINDMILL POINT RANGE—Two fixed red lights.

ISLE AUX PECHES RANGE—Two fixed white lights.

GROSSE POINT LIGHT SHIP—Fixed white.

ST. CLAIR FLATS OLD CUT RANGE—Two fixed white lights.

ST. CLAIR FLATS SHIP CANAL—Lower light—Fixed red.

ST. CLAIR FLATS SHIP CANAL—Upper light—Fixed red.

Lighthouses in St. Clair River.

LOWER REACH LIGHT NO. 1—Fixed white.

MIDDLE LIGHT NO. 2—Fixed red.

UPPER LIGHT NO. 3.—Fixed white.

SOUTHEAST BEND LOWER LIGHT—Fixed red.

SOUTHEAST BEND MIDDLE LIGHT—Fixed red.

SOUTHEAST BEND UPPER LIGHT—Fixed white up stream, red down stream.

HERSON'S ISLAND LOWER LIGHT—Fixed red.

HERSON'S ISLAND MIDDLE LIGHT—Fixed white.

HERSON'S ISLAND UPPER LIGHT—Fixed red.

RUSSEL ISLAND LOWER LIGHT—Fixed white.

RUSSEL ISLAND MIDDLE LIGHT—Shows white down stream, red up stream.

RUSSEL ISLAND UPPER LIGHT—Fixed red.

CORUNNA RANGE—Two fixed white lights.

FORT GRATIOT RANGE—Two fixed red lights.

FORT GRATIOT MAIN LIGHT—Fixed white varied by a white flash.

POINT EDWARD RANGE—Two fixed red lights.

Gas Buoys in the Detroit and St. Clair Rivers.

BALLARD REEF NO. 2—Occulting white.

BALLARD REEF NO. 4—Occulting white.

BALLARD REEF NO. 6—Occulting white.

GROSSE POINT CUT is marked by four occulting white on west side and four occulting red on east side.

ST. CLAIR FLATS CANAL ENTRANCE—East side—Occulting red.

ST. CLAIR FLATS CANAL ENTRANCE—West side—occulting white.

RUSSEL ISLAND SHOAL GAS BUOY—Occulting white.

ST. CLAIR MIDDLE GROUND—Lower buoy—Occulting red.

ST. CLAIR MIDDLE GROUND—Upper buoy—Occulting white.

BLACK RIVER SHOAL—Occulting white.

Lighthouses on Lake Huron—American.

FORT GRATIOT—Fixed white varied by a white flash every minute.

LAKE HURON LIGHTSHIP NO. 61—Fixed white.

PORT SANILAC—Fixed red.

HARBOR BEACH—East entrance—North light, flashing red and white. South light, fixed red.

HARBOR BEACH—North entrance—East light, fixed white. West light, fixed red.

POINT AUX BARQUES—Flashing white every 10 seconds.

PORT AUSTIN REEF—Fixed white for one minute, 5 red flashes next minute.

CHARITY ISLAND—Fixed white.

SAGINAW RIVER RANGE—Two red lights.

TAWAS POINT—Fixed for 25 seconds, eclipse for 5 seconds; shows white from SE. to NE., red through remaining sector.

AU SABLE—Fixed red, on north pier.

STURGEON POINT—Fixed white.

ALPENA—Fixed red, on crib on north side of entrance to river.

THUNDER BAY ISLAND—Flashing white every 90 seconds.

MIDDLE ISLAND—Fixed red.

PRESQUE ISLE—Fixed white.

PRESQUE ISLE HARBOR RANGE—Two fixed white lights.

FORTY MILE POINT—Flashing white every 10 seconds.

SPECTACLE REEF—Flashing alternately red and white every 30 seconds.

POE REEF LIGHTSHIP—Fixed white.

CHEBOYGAN POINT—Fixed white varied by white flash every minute.

CHEBOYGAN CRIB—Fixed red.

CHEBOYGAN RIVER RANGE—Two fixed red lights.

ROUND ISLAND—Fixed white varied by a red flash every 20 seconds.

BOIS BLANC ISLAND—Fixed white.

OLD MACKINAC POINT—Flashing red every 10 seconds.

DETOUR POINT—Fixed white.

Lighthouses on Lake Huron—Canadian.

GODERICH MAIN LIGHT—Fixed white.

GODERICH RANGE—Front, fixed red, on north breakwater. Back, fixed green, on north pier.

POINT CLARK—Revolving white every 30 seconds.

KINCARDINE RANGE—Front, fixed red, on north pier. Back, flashing red and white every 20 seconds.

PORT ELGIN SOUTH RANGE—Front, fixed white. Back, fixed red.

PORT ELGIN NORTH RANGE—Front, fixed white. Back, red.

CHANTRY ISLAND—Fixed white.

SOUTHAMPTON HARBOR RANGE—Front, fixed red to N.; white in harbor. Back, fixed white.

SAUGEEN RANGES—Two green lights.

LYAL ISLAND—Revolving white every 15 seconds.

STOKES BAY RANGE—Two fixed white lights.

COVE ISLAND—Flashing white every 15 seconds.

SOUTH BAYMOUTH RANGE—Two fixed white lights.

MICHAEL POINT—Fixed white.

PROVIDENCE BAY—Fixed white.

GREAT DUCK ISLAND—One red and two white flashes every 2 minutes.

MISSISSAGI PASSAGE—Fixed white, on east side of passage.

Gas Buoys on Lake Huron—American.

GRAVELLY POINT SHOAL—Occulting white.

SAGINAW RIVER ENTRANCE—Occulting white.

TAWAS POINT—Occulting white.

NORTH POINT—Occulting white.

MACKINAC ISLAND—Occulting white.

MARTIN REEF—Occulting white.

DETOUR REEF—Occulting white.

Lighthouses on Georgian Bay—Canadian.

COVE ISLAND—Flashing white every 15 seconds.

TOBERMORY—Fixed red, on west side of entrance.

FLOWER POT ISLAND—Fixed white.

CABOT HEAD—3 white flashes 20 seconds apart, then eclipse 40 seconds.

LION HEAD HARBOR—Fixed red.

CAPE CROKER—Revolving white, eclipse 4½ seconds.

WIARTON—Fixed red, near outer end of breakwater.

GRIFFITH ISLAND—Fixed white.

PRESQUE ISLE—Fixed white.

OWEN SOUND RANGES—Two red lights.

MEAFORD—Fixed white on each pier.

THORNBURY RANGE—Front, fixed white. Back, fixed red.

NOTTAWASAGA ISLAND—Revolving white every 30 seconds. Red sector covers shoal.

COLLINGWOOD ENTRANCE RANGE—Two red lights.

COLLINGWOOD SHORE RANGE—Two fixed white lights.

CHRISTIAN ISLAND—Fixed white.

HOPE ISLAND—Revolving white every minute.

GIANTS TOMB—Fixed white.

BREBEUF RANGE—Two fixed white lights.

MIDLAND POINT RANGE—Two fixed white lights.

MIDLAND RANGE—Two fixed red lights.

WHISKEY ISLAND—Fixed white.

PENETANGUISHENE—Fixed white.

WESTERN ISLANDS—Fixed white varied by a white flash every 30 seconds.

RED ROCK—Fixed white.

SNUG HARBOR RANGE—Front, fixed red. Back, fixed white.

JONES ISLAND RANGE—Front, fixed red. Back, fixed white.

CARLING ROCK—Fixed white.

KILLBEAR POINT—Fixed white.

DEPOT ISLAND—Fixed red.

POINT AU BARIL RANGE—Front, fixed white. Back, fixed red.

GEREAUX ISLAND—Fixed white.

BING INLET RANGE—Two fixed red lights.

BUSTARD ROCK RANGE—Three white lights.

FRENCH RIVER RANGE—Two fixed red lights.

LONELY ISLAND—Fixed white.

KILLARNEY EAST—Fixed white.

KILLARNEY WEST—Fixed white.

MANITOWANING—Fixed white.

STRAWBERRY ISLAND—Fixed white.

LITTLE CURRENT RANGE—Front, fixed red. Back, fixed white.

NARROW ISLAND—Fixed white. Red sector over shoal.

CLAPPERTON ISLAND—Fixed white.

KAGAWONG—Fixed white.

BOYD ISLAND—Fixed red.

CUTLER RANGE—Two fixed red lights.

GORE BAY—Fixed white.

CAPE ROBERTS—Fixed white.

BLIND RIVER RANGE—Two fixed red lights.

MISSISSAGI ISLAND—Revolving white.

TOLSMAVILLE—Fixed white.

SULPHUR ISLAND—Fixed white.

THESSALON—Fixed white.

BRUCE MINES—Fixed white.

NORTH SISTER ROCK—Fixed white.

BAMFORD ISLAND—Fixed white.

SHOAL ISLAND—Fixed white.

Gas Buoys in Georgian Bay.

LOCKERBIE ROCK—Occulting white.

LONE ROCK—Occulting white.

SEGUIN BANK—Occulting white.

PARRY SOUND—Three Star Shoal Gas Buoy—Occulting white. Middle Ground Gas Buoy—Occulting white. Hooper Island Gas Buoy —Fixed white. Spruce Island Gas Buoy—Fixed white.

Lighthouses in the Soo River.

DETOUR POINT—Fixed white.

FRYING PAN ISLAND—Fixed red.

PIPE ISLAND—Fixed red.

SWEETS POINT—Fixed white.

ROUND ISLAND—Fixed white, with two red sectors covering shoals.

WINTER POINT RANGE—Two white lights.

MUD LAKE CRIB—Fixed white for 5 seconds, eclipse 10 seconds.

PILOT ISLAND RANGE—Two fixed white lights.

ENCAMPMENT CRIB—Fixed red.

POINT OF WOODS RANGE—Two red lights.

DARK HOLE RANGE—Two fixed white lights.

HARWOOD POINT RANGE—Two fixed white lights.

MIDDLE NEEBISH RANGE—Two fixed white lights.

LOWER HAY LAKE RANGE—Two fixed white lights.

NINE MILE POINT—Fixed red.

MIDDLE HAY LAKE RANGE—Two fixed white lights.

FRETCHETT POINT RANGE—Two fixed white lights.

SIX MILE POINT RANGE—Two fixed white lights.

NORTH ENTRANCE CUT LIGHT—Fixed white occulting every 5 seconds.

BAYFIELD ROCK RANGE—Two fixed white lights.

VIDAL SHOAL RANGE—Front, flashing red every 10 seconds. Back, fixed red.

POINT AUX PINS RANGE—Two fixed white lights.

POINT AUX PINS—Fixed white.

ST. MARY'S RIVER LOWER RANGE—Two fixed red lights.

ST. MARY'S RIVER UPPER RANGE—Two fixed white lights.

HEAD OF ST. MARY'S RIVER RANGE—Two fixed white lights.

POINT IROQUOIS—Flashing white every 30 seconds.

Gas Buoys in the Soo River.

DETOUR REEF—Occulting white.

POINT AUX FRENES—Occulting white.

RAINS DOCK—Occulting red.

DARK HOLE—Occulting red.

COYLE POINT—Occulting red.

STRIBLING POINT—Occulting white.

HAY LAKE ENTRANCE—Occulting white.

MIDDLE NEEBISH CUT—Occulting red.

VIDAL SHOAL NO. 2—Occulting red.

VIDAL SHOAL NO. 4.—Occulting red.

VIDAL SHOAL NO. 1—Occulting white.

BRUSH POINT GAS BUOY—Occulting white.

CEDAR POINT GAS BUOY—Occulting white.

MIDDLE GROUND GAS BUOY—Occulting red.

MIDDLE GAS BUOY—Occulting white.

GROS CAP REEF GAS BUOY—Occulting red.

Lighthouses on Lake Superior—American.

WHITEFISH POINT—Flashing white every 10 seconds.

CRISP POINT—Fixed red.

GRAND MARAIS RANGE—Two fixed red lights.

BIG SABLE POINT—Fixed white.

GRAND ISLAND—Fixed white varied by a white flash every 90 seconds.

GRAND ISLAND HARBOR—Fixed white.

GRAND ISLAND HARBOR RANGE—Two fixed white lights.

MARQUETTE—Fixed white.

MARQUETTE BREAKWATER—Fixed red.

GRANITE ISLAND—Fixed white with red flashes every 90 seconds.

BIG BAY POINT—Fixed white varied by a white flash every 20 seconds.

STANNARD ROCK—Flashing white every 30 seconds.

HURON ISLAND—Fixed white.

SAND POINT—Fixed red.

PORTAGE ENTRY—Fixed white with red flash every 60 seconds.

PORTAGE RIVER PIERHEAD LIGHT—Fixed red.

ENTRANCE RANGE—Two fixed white lights.

MENDOTA—Fixed white.

MANITOU ISLAND—Fixed white varied by a white flash every 60 seconds.

GULL ROCK—Fixed red.

COPPER HARBOR—Fixed white.

COPPER HARBOR RANGE—Two fixed white lights.

EAGLE HARBOR—Fixed white varied by a white flash every 60 seconds.

EAGLE HARBOR RANGE—Two fixed white lights.

EAGLE RIVER—Fixed white.

PORTAGE LAKE SHIP CANAL—Main light—Fixed white.

PORTAGE LAKE—East breakwater—Occulting red.

PORTAGE LAKE—West breakwater—Occulting red.

PORTAGE LAKE—Pierhead—Fixed red, on west pier.

FOURTEEN MILE POINT—Fixed white varied by a red flash every 20 seconds.

ONTONAGON—Fixed white.

ONTONAGON PIERHEAD—Fixed red, on west pier.

OUTER ISLAND—Flashing white every 90 seconds.

MICHIGAN ISLAND—Fixed white.

LA POINTE—Fixed white.

CHEQUAMEGON POINT—Fixed red.

RASPBERRY ISLAND—Fixed white varied by a white flash every 60 seconds.

DEVIL'S ISLAND—Flashing red and white every 10 seconds.

SAND ISLAND—Fixed white.

SUPERIOR RANGE—Two fixed white lights.

DULUTH RANGE—Front, fixed red. Back, flashing red every 10 seconds.

TWO HARBORS—Fixed white.

TWO HARBORS BREAKWATER—Occulting red, on west end of E. breakwater.

GRAND MARAIS, MINN.—Fixed white.

GRAND MARAIS BREAKWATER—Occulting red.

ISLE ROYALE—Fixed white.

PASSAGE ISLAND—Flashing white every 10 seconds.

Lighthouses on Lake Superior—Canadian.

CORBAY POINT—Fixed white.
COPPERMINE POINT—Fixed white.
GARGANTUA—Fixed white.
MICHIPICOTEN HARBOR—Fixed white.
MICHIPICOTEN ISLAND—Fixed white.
CARIBOO ISLAND—Revolving white, eclipse 10 seconds.
AGATE ISLAND—Fixed white.
OTTER ISLAND—Fixed white temporarily.
PENINSULA HARBOR—Revolving white every 30 seconds.
SLATE ISLANDS—Fixed white, temporarily.
BATTLE ISLAND—Flashing red and white.
LAMB ISLAND—Fixed white.
PORPHYRY POINT—Fixed white.
SILVER ISLET RANGE—Two fixed white lights.
THUNDER CAPE—Revolving white every 60 seconds.
WELCOME ISLAND—Fixed white.
KAMINISTIQUA RANGE—Two fixed red lights.
PORT ARTHUR CRIB—Fixed red.
PIE ISLAND—Fixed white.
VICTORIA ISLAND—Fixed white.

Gas Buoys on Lake Superior.

FORT WILLIAM GAS BUOY—Occulting white.
PORT ARTHUR GAS BUOY—Occulting white.

Lighthouses on Lake Michigan.

OLD MACKINAC—Flashing red every 10 seconds.
McGULPIN'S POINT—Fixed white.
ST. HELENA ISLAND—Fixed red.
WAUGOSHANCE—Fixed white, varied by a white flash every 45 seconds.
WHITE SHOAL LIGHTSHIP—Fixed white.
GRAY'S REEF LIGHTSHIP—Fixed white.
LANSING SHOAL LIGHTSHIP—Fixed red.
SKILLIGALLEE—Fixed white.
BEAVER ISLAND HARBOR—Fixed red.
BEAVER ISLAND—Fixed white varied by a white flash every 60 seconds.
LITTLE TRAVERSE—Fixed red.
PETOSKEY—Red over white.
CHARLEVOIX—Fixed red, on pier.

SOUTH FOX ISLAND—Fixed red varied by a red flash every 2 minutes.

GRAND TRAVERSE—Fixed white.

MISSION POINT—Fixed white.

NORTH MANITOU—Flashing red and white every 10 seconds.

SOUTH MANITOU—Fixed white.

POINT BETSEY—Flashing white every 10 seconds.

FRANKFORT PIERHEAD RANGE—Two fixed red lights, on south pier.

PORTAGE LAKE RANGE—Two fixed red lights, on north pier.

MANISTEE MAIN LIGHT—Fixed white varied by a red flash every 45 seconds.

MANISTEE PIERHEAD—Fixed red.

GRAND POINT AU SABLE—Fixed white.

LUDINGTON NORTH PIER—Fixed red.

LUDINGTON RANGE—Two fixed red lights, on south pier.

PENTWATER RANGE—Two fixed red lights, on south pier.

PETITE POINT AU SABLE—Fixed white varied by a white flash every 30 seconds.

WHITE RIVER—Flashing red and white.

WHITE RIVER PIER—Fixed red on south pier.

MUSKEGON RANGE—Front, fixed red. Back, fixed white, on south pier.

MUSKEGON LAKE LIGHT—Fixed red.

BANK POINT—Fixed red.

GRAND HAVEN PIER—Fixed white varied by a white flash every 60 seconds on south pier.

HOLLAND RANGE—Two fixed red lights, on south pier.

KALAMAZOO—Fixed white.

KALAMAZOO PIER—Fixed red, on south pier.

SOUTH HAVEN PIER—Fixed red, on south pier.

ST. JOSEPH—Flashing white every 30 seconds.

ST. JOSEPH RANGE—Two fixed red lights, on north pier.

MICHIGAN CITY BREAKWATER LIGHT—Fixed red.

MICHIGAN CITY EAST PIER—Fixed white.

MICHIGAN CITY WEST PIER—Fixed red.

CALUMET HARBOR—To be established.

CALUMET PIER—Fixed red, on north pier.

CHICAGO HARBOR—Flashing red and white every 10 seconds.

CHICAGO OUTER BREAKWATER—Fixed red.

CHICAGO BREAKWATER—South light, fixed red.

CHICAGO BREAKWATER—North light, fixed white.

CHICAGO PIERHEAD RANGE—Front, fixed red. Back, fixed white.

GROSSE POINT—Fixed white varied by a red flash every 3 minutes.

WAUKEGAN—Fixed white for 20 seconds, followed by 4 red flashes.

WAUKEGAN BREAKWATER—Fixed red.

KENOSHA—Flashes white every 15 seconds.

KENOSHA RANGE—Two fixed red lights. Front on breakwater. Back on north pier.

RACINE BREAKWATER—Fixed red, on south end of breakwater.

RACINE PIERHEAD—Fixed red, on north pier.

RACINE REEF—Fixed white.

RACINE POINT—Flashing white every 30 seconds. Red sector covers reef.

MILWAUKEE—Fixed white varied by a white flash every 30 seconds.

MILWAUKEE BREAKWATER—Red above white, on south end of breakwater.

MILWAUKEE NORTH PIERHEAD—Fixed red.

PORT WASHINGTON—Fixed red.

SHEBOYGAN BREAKWATER—Fixed red, on south end of breakwater.

SHEBOYGAN PIERHEAD—Fixed red, on north pier.

MANITOWOC BREAKWATER—Fixed red.

MANITOWOC PIER—Fixed red, on north pier.

TWO RIVERS PIER—Fixed red, on north pier.

TWIN RIVER POINT—Fixed white varied by a white flash every 30 seconds.

KEWAUNEE RANGE—Two fixed red lights, on north pier.

ALGOMA (AHNAPEE) RANGE—Two fixed red lights, on north pier.

STURGEON BAY CANAL—Flashing red and white every 10 seconds.

STURGEON BAY PIER—Fixed red, on north pier.

BAYLEY HARBOR RANGE—Two fixed white lights.

CANA ISLAND—Fixed white.

PILOT ISLAND (DEATH'S DOOR)—Fixed white varied by a white flash every 15 seconds.

PLUM ISLAND RANGE—Two fixed red lights.

ROCK ISLAND—Fixed white.

ST. MARTIN'S ISLAND—Flashing red and white every 5 seconds.

POVERTY ISLAND—Flashing red every 15 seconds.

SEUL CHOIX POINT—Fixed white.

SQUAW ISLAND—Fixed red varied by a red flash every 15 seconds.

Gas Buoys on Lake Michigan.

SOUTH FOX ISLAND SHOAL—Occulting white.

NORTH MANITOU SHOAL—Occulting white.

CALUMET BAR—Occulting white.

WIND POINT NORTH SHOALS—Occulting red.

FISHERMAN SHOAL—Occulting white.

WIGGINS POINT—Occulting white.

Lighthouses on Green Bay.

ELEVEN-FOOT SHOAL LIGHT-SHIP—Fixed white.

POINT PENINSULA—Flashing white every 30 seconds.

ESCANABA—Fixed red.

SQUAW POINT—Fixed white; red sector over shoal.

CEDAR RIVER—Fixed white.

CEDAR RIVER RANGE—Two fixed red lights, on north pier.

EAGLE BLUFF—Fixed white.

CHAMBER ISLAND—Fixed white varied by a white flash every 30 seconds.

MENOMINEE PIER—Fixed red, on north pier.

GREEN ISLAND—Fixed white.

SHERWOOD POINT—Fixed white varied by a red flash every 60 seconds.

DUNLAP REEF RANGE—Two fixed white lights.

PESHTIGO REEF LIGHT-SHIP—Fixed white.

TAIL POINT—Fixed white.

GRASSY ISLAND UPPER LIGHT—Fixed white.

GRASSY ISLAND LOWER LIGHT—Fixed white.

Gas Buoys on Green Bay.

POVERTY ISLAND SHOAL GAS BUOY—Occulting red.

GRAVELLY SHOAL GAS BUOY—Occulting white.

WHALEBACK SHOAL GAS BUOY—Occulting white.

GREEN BAY ENTRANCE GAS BUOY—Occulting white.

DRAFTS OF WATER AT THE SMALLER AND LESS USED PORTS OF THE GREAT LAKES.

At the larger lake ports a depth of twenty feet is generally maintained.

Lake Ontario—South Shore.

Olcott,	12 feet
Oak Orchard,	9 feet
Charlotte,	18 feet
Oswego,	17 feet
Kingston, city front docks,	12 to 20 feet

Lake Ontario—North Shore.

Deseronto,	12 feet
Belleville,	10 feet
Trenton,	14 feet
Port Hope,	14 feet
New Castle,	12 feet
Oshawa,	14 feet
Whitby,	14 feet
Pickering, between piers,	8 feet
Toronto,	14 feet at docks
Port Credit,	8 feet
Oakville,	10 feet
Channel into Burlington Bay,	18 feet
Hamilton,	16 to 18 feet at docks

Lake Erie—South Shore.

Dunkirk,	18 feet
Vermillion,	11 feet
Kelley Island, north dock,	13 feet
Kelley Island, south dock,	13 feet
Kelley Island, west dock,	16 feet
Port Clinton,	10 feet
Munroe, entrance,	14 feet
Munroe, city docks,	10 to 12 feet

Lake Erie—North Shore.

Kingsville,	12 feet
Leamington,	13 feet
Rondeau, between piers,	14 feet
Port Stanley,	13 feet

Port Bruce,	5 feet
Port Burwell,	16 feet
Port Rowan,	5 feet
Port Dover,	8 feet
Port Maitland,	8 feet
Port Colborne,	15 feet

Lake Huron—West Shore.

Lexington,	11 feet
Sanilac,	10 feet
Harbor Beach, east entrance,	20 feet
Harbor Beach, north entrance,	20 feet
Harbor Beach, south entrance,	8 feet
Harbor Beach, at main breakwater,	20 feet
Harbor Beach, city docks,	12 feet
Port Hope,	10 feet
Grindstone City,	9 feet
Port Austin,	9 feet
East Tawas,	12 feet
Au Sable,	13 feet
Harrisville,	15 feet
Alpena,	15 feet
Presque-Isle,	14 feet
Rodgers City,	13 feet
Cheboygan,	18 feet
Old Mackinac,	18 feet

Lake Huron—East Shore.

Goderich,	19 feet to elevator on south side of harbor
Goderich,	14 feet to wharf on north side of harbor
Kincardine,	14 feet
Port Elgin,	10 feet
Southampton,	13½ feet

Georgian Bay.

Tobermory,	25 to 40 feet
Wiarton,	16 feet
Owen Sound,	20 feet
Meaford,	20 feet
Thornbury,	10 feet
Collingwood,	21 feet
Penetanguishene, entrance to harbor,	21 feet
Penetanguishene, lumber docks,	12 feet

Penetanguishene, tannery dock,	9 feet
Midland,	18 feet to elevators
Victoria Harbor,	16 feet
Waubashene,	13 feet
Depot Harbor,	20 to 24 feet
Killarney,	17 feet
Little Current,	Over 16 feet at lumber docks
Little Current, through passage,	12 feet. (Contractors now engaged in deepening channel to 25 feet.)
Gore Bay Docks,	18 feet
Cutler,	18 feet
Little Detroit passage,	21 feet
Spanish Mills,	14 to 20 feet
Serpent Harbor (Spragge)	13 to 14 feet
Algoma Mills,	14½ feet
Blind River,	12½ feet
Thessalon, at pier,	18 feet
Thessalon, city docks,	12 feet
Bruce Mines, coal docks,	16 feet

Lake Michigan—East Shore.

Cross Village,	12 feet
Harbor Springs,	14 feet
Petoskey,	14 feet
Charlevoix,	15 feet
East Jordan, latest reports,	12 feet
South Arm, latest reports,	12 feet
Frankfort, generally not less than (needs frequent dredging)	18 feet
Manistique,	15 feet
Ludington,	18 feet
Pentwater,	13 feet
Muskegon,	16 feet
Grand Haven,	17 feet
Holland,	15 feet
Saugatuck,	8 feet
South Haven,	14 feet
St. Joseph Harbor,	16 feet
Michigan City,	15 feet
Waukegan,	20 feet
Kenosha,	18 feet
Racine,	20 feet
Port Washington,	12 feet

Sheboygan,	20 feet
Manitowoc,	18 feet
Two Rivers,	12 feet
Kewaunee	15 feet
Algoma (Ahnapee)	12 feet
Sturgeon Bay, drawbridge, north draw,	15 feet
Sturgeon Bay, drawbridge, south draw,	12 feet
Manistique,	14 feet

Green Bay.

Green Bay City, entrance from bay,	19 feet
Green Bay City, up river to Depere,	15 feet
Oconto,	8 feet
Menominee River,	19 feet
Cedar River,	12 feet
Ford River,	11½ feet
Wells,	16 feet
Garth,	12 feet
Nahma,	15 feet

Lake Superior—South Shore.

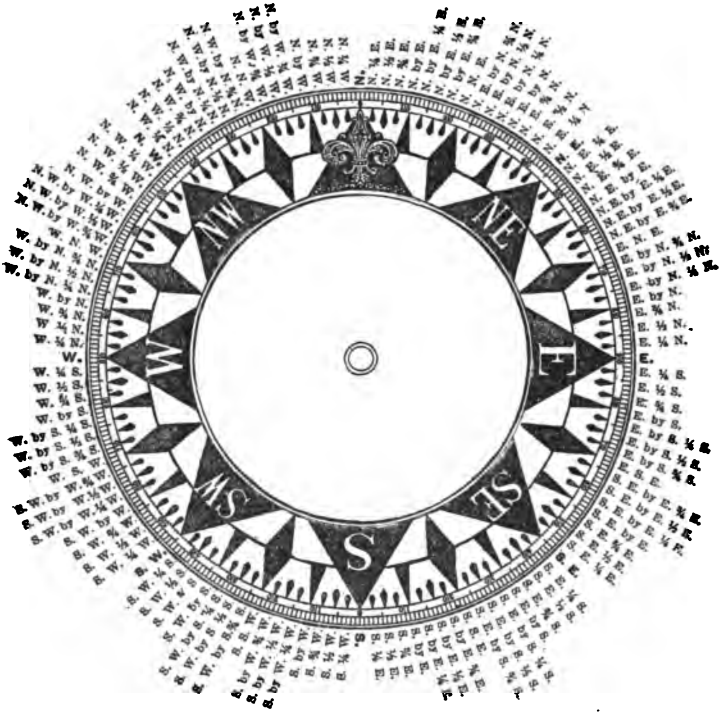
Grand Marais, Mich.,	16 feet
Pequaming,	15 feet and upwards
Keewenaw Bay, Mass Co.'s dock,	16 feet
Chassell,	14 feet
Channel into Lac La Belle,	12 feet
Copper Harbor, Entrance	18 feet
Copper Harbor, Anchorage,	18 feet
Eagle Harbor,	Now less than 12 feet on account of rip-rap obstructions
Eagle River,	No longer navigable
Ontonogan,	Less than 12 ft. at docks for 1906—needs dredging each season.
Washburn,	12 to 16 feet at lumber docks. Water for deep draft boats at big freight docks.
Bayfield,	Deep water at all lumber and freight docks
Bayfield, over water works pipe,	18 feet
Redcliff,	Over 20 feet
Herbster,	10 to 12 feet
Port Wing,	Generally 14 feet, but needs yearly dredging

Lake Superior—North Shore.

Grand Marais, Minn.,	15 feet

The Mariner's Compass

SHOWING EVERY POINT AND DEGREE.



THE COMPASS.

The Chinese claim to have invented the compass in the year 2634 B. C., but the earliest date that they appear to have used it at sea was about 300 A. D. The Italians have always contended that Flavio Gioza, of Amalfa, Italy, invented the compass in the year 1362 A. D., but it has been proven that the compass was well known as a nautical instrument long before that date.

Variation of the Compass.

The essential part of the compass is the magnetized needle, balanced freely on a fine point; one end pointing to the north and the other to the south—but not exactly—the angle between the true north and that shown by the compass needle being called 'variation.' Different localities give different variation, sometimes the needle pointing to the eastward of the true north and sometimes to the westward. Again there are places on the lakes where there is no variation, the needle pointing to the true north. The cause of this variation is not known. And the variation is gradually changing—the north end of the needle is moving slowly to the westward, causing westerly variation to increase and easterly variation to decrease. The average movement is about four minutes yearly. At this rate it will require forty years to move the needle a quarter of a point.

It is absolutely necessary for the navigator to know the exact amount of variation over the course that he is shaping, otherwise he could not make a correct course. If he finds that the variation is ¼ westerly and his chart course is north, he then steers N. ¼ east. The government books and charts show the amount of variation at different places.

Deviation of the Compass.

The deviation of the compass needle is that attraction caused by the iron or steel in the ship, causing the needle to deviate from its true course. Deviation is corrected by magnets, placed in different positions near the ship to off-set the local attraction. This operation is called adjusting the compass and is generally done by expert 'compass adjusters.'

A Few Points About Compasses.

The liquid and oil compasses have about taken the place of the old card compass. In a liquid compass the bowl is filled with a solution of about equal parts of pure alcohol and water. In an oil compass the bowl is filled with benzine. Ritchie and Bliss compasses are liquid compasses. The Baker is an oil compass. In an oil compass the magnetic needles are flat bright steel bars. The needle in a liquid compass is enclosed in a round case to keep it from the action of the alcohol.

There are four cardinal points in a compass; north, south, east and west.

There are four inter-cardinal points; NE., SE., SW., NW.

There are 32 points in a compass or 360 degrees. There are 11¼ (11 degrees 15 minutes) degrees in a point. Degrees are reckoned only from north and south. You would say N. 80 degrees W., instead of W. 10 degrees N. The compass is read by points in two different ways; lake men have a way of reading it which appears to be all their own, while scientific navigators read it in a different way. Navigators should be familiar with either style. A course read by lake men as NE. by N. ½ N. would be read by scientific navigators as N. NE. ½ E., and so on.

About Variation of the Compass Needle on the Lakes.

The question is often asked "how fast is the variation increasing or decreasing and how long can we use our present courses."

The change is nearly the same on all the lakes, the north end of the compass needle moving west, causing westerly variation to increase and easterly variation to decrease. The average amount of this movement is about 4 minutes annually. Therefore it will take about 40 years to change the variation a quarter of a point.

The places of greatest variation of the compass needle are the east end of Lake Ontario, Georgian Bay, and the west end of Lake Superior. The variation reaches almost one point westerly in the east end of Lake Ontario. In Georgian Bay the variation averages ½ point westerly. In the west end of Lake Superior the variation is from ½ to ¾ of a point easterly. There is very little variation on Lake Michigan, the greatest deflection of the needle being only a trifle over ¼ point. There is pratically no variation in the north end of Lake Michigan. The average variation on Lake Huron is ¼ point.

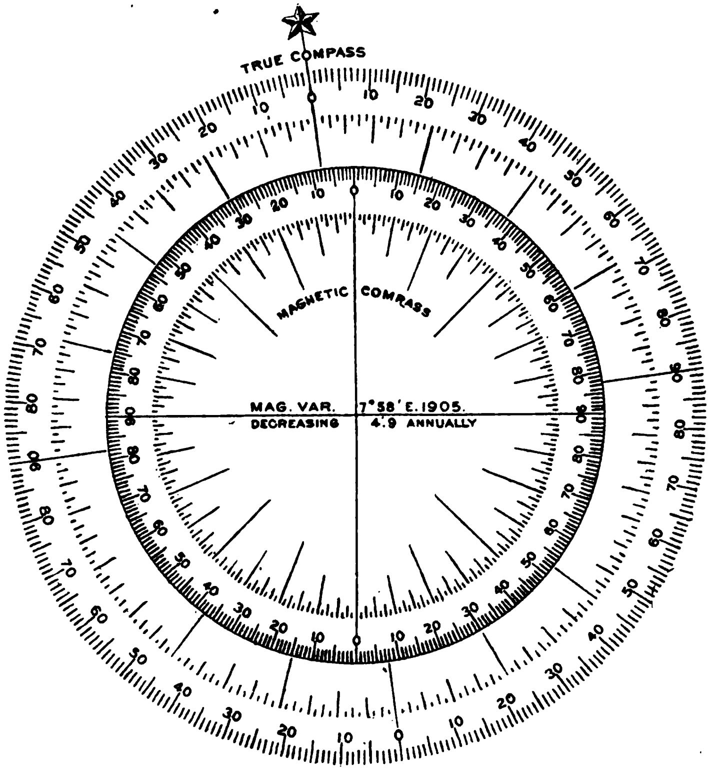
In figuring out a long course where the variation is not the same, an average variation should be found as follows: On the course from Eagle Harbor to Devil's island the variation near the east end of the course will be found to be 3 degrees 28 minutes easterly, at Devil's island it is 5 degrees 39 minutes easterly and about midway along the course the variation is found to be 2 degrees 58 minutes easterly. By adding these three amounts of variation together and dividing by 3, an average variation is found of 4 degrees easterly.

The greatest variation of the compass needle on the Great Lakes is about ten degrees.

In some parts of the world the variation of the compass needle is so great that the needle points east and west instead of north and south.

The average variation in the Atlantic ocean is 20 degrees westerly.

A COMPASS CARD CUT FROM A GOVERNMENT CHART SHOWING THE VARIATION OF THE COMPASS NEEDLE AT DULUTH.



A HANDY TABLE FOR CORRECTING COURSES FOR MAGNETIC VARIATION.

(Seconds are not given as being too small for calculations of this kind.)

One degree and 24 minutes (1°, 24′) equals ⅛ of a point.
Two degrees and 48 minutes (2°, 48′) equals ¼ of a point.
Five degrees and 38 minutes (5°, 38′) equals ½ of a point.
Eleven degrees and 15 minutes (11° 15′) equals 1 Point.

Sixty seconds—one minute.

Sixty minutes—one degree.

Eleven and one-fourth degrees—one point.

In correcting courses, a fraction of a point less than ⅛ is seldom used. If your chart course is N by E, and the variation at that point is two degrees and 48 minutes west, then (above table) add ¼ point to the eastward of the course, making corrected course N by E ¼ E. If the variation at that point is only two degrees 20 minutes, (as an example) add ¼ just the same. This would be near enough for all practical purposes, but if the variation is nearer an ⅛ of a point, then add ⅛ to the course, and so on.

THE NORTH STAR AND HOW IT BEARS ON DIFFERENT LAKES.

The north star (Polaris) bears true north, or so nearly so, that it can be used for all compass purposes. For a certain part of the day it varies a little to the eastward of the true north and then a little to the westward (less than ⅛ point) while for the balance of the day it bears exactly true north.

To get the magnetic bearing of the north star it is then necessary to allow the variation.

Therefore, with the present variation, the north star would bear at Buffalo—N ½ E, magnetic; Cleveland—N ¼ E, magnetic; Port Huron—N. ¼ E., magnetic.

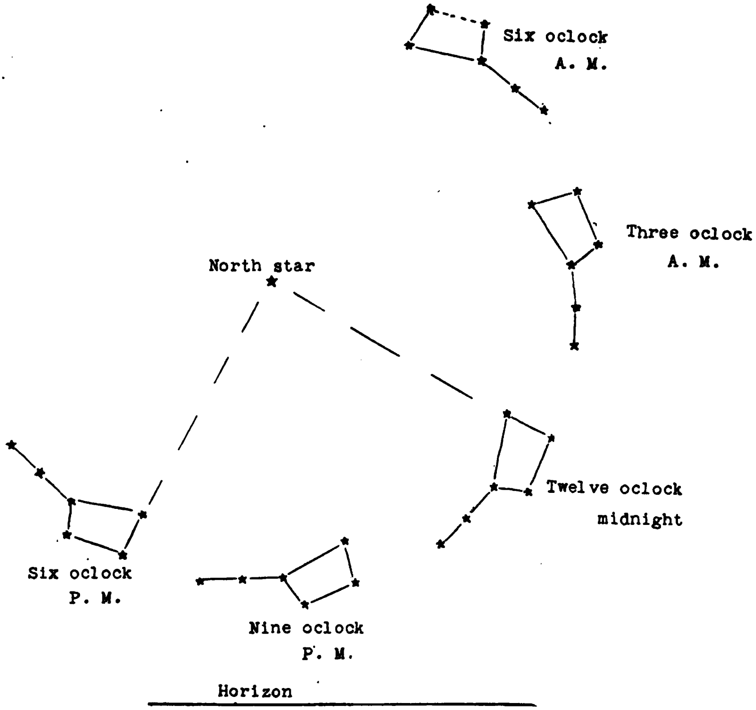
On the entire course from Fort Gratiot to Detour it bears N ¼ E, magnetic; in Georgian Bay—N ½ E, magnetic; Sault Ste Marie—N ¼ E, magnetic; Keweenaw Point—N ⅛ W, magnetic; Devil's island—N ½ W, magnetic; Duluth—N ⅝ W, magnetic; Straits of Mackinac—N ⅛ E, magnetic; Beaver islands—due north, magnetic; from the Manitous to Chicago—N. ¼ W., magnetic.

FINDING THE COMPASS ERROR BY THE NORTH STAR.

Set the pointer of your bearing finder to the same course as is shown by your compass and then point the sight bar at the north star, when the error will be shown at once.

HOW TO FIND THE NORTH STAR.

The big dipper and all the northern stars appear to revolve about the north star every twenty-four hours, but the two stars that form the side of the bowl, away from the handle, always form a range that point directly at the north star; therefore by finding the dipper it is then an easy matter to find the north star. A diagram is given below that shows the approximate position of the dipper from 6 p. m. to 6. a. m., central standard time during the month of October. Of course the dipper is not in the same position, at the time shown below, during every night in the year. Six months later the big dipper would be found on the opposite side of the north star at the time shown in the diagram.



MAGNETIC ATTRACTION ON THE NORTH SHORE OF LAKE SUPERIOR.

For years vessel masters have reported that their compasses were affected when on the north shore of Lake Superior, from Duluth to Isle Royal. In 1902, magnetic observations were made under the direction of Capt. D. D. Gaillard (Corps of Engineers, U. S. Army) which confirm the reports of local attraction in this locality. The greatest attraction was found at Stony Point, 18 miles from Duluth. Here, where the normal variation should be about eight degrees east, a variation was found as high as 26 degrees east—a local attraction of 18 degrees east. The greatest attraction was close in-shore, gradually decreasing, until at a distance of three miles from shore the local attraction disappeared. The local attraction in this locality draws the north end of the needle to the east.

USE YOUR WATCH AS A COMPASS.

Point the hour hand at the sun and due south will lie exactly midway between the hour hand and the figure 12 on the dial. For example: The hour hand points to 9 o'clock; then south will be just between 10 and 11.

MEASURING DISTANCES BY SOUND.

A rule for measuring distances by sound is often very valuable to the lake pilot who is navigating in a fog as it is often possible to get an echo from the shore. In ordinary temperature sound travels about 1125 feet in a second and a lttle less when the temperature is at freezing point. But 1125 feet is near enough for ordinary purposes. For example: You sound your whistle and the echo returns in 10 seconds; 1125x10=11250 feet. As the sound has to travel there and return, the distance that you are away from the object that caused the echo will then be half the above number of feet, which is 5625 feet or a trifle over one mile. This rule for finding the distance away from shore is not always reliable as it may happen that the echo is thrown from high land back from a low shore. And a dense fog bank will sometimes throw an echo. A perfect knowledge of the locality that you are in will make this rule more safe.

THE PELORUS.

The 'Pelorus' was first invented by Lieutenant Friend, R. N., about the middle of the last century, and while it is now made in various forms and the methods vary in arriving at the required results from it, its principle remains the same as at first, i. e.—an instrument to measure horizontal angles. It is essentially a nautical instrument and its principal use is to determine the correct course to steer and the deviation of the compass, if there be any, also to get accurate bearings of distant objects.

The 'Pelorus' is an almost invaluable instrument on iron ships or on ships carrying cargoes which cause deviations of the compass, because the correct course can be found quickly and accurately from the sun or other celestial bodies. The system used is called 'Time Azimuths,' and is so very simple that anyone can learn in an hour or two.

The essentials necessary are correct time, variation, and the ship's position, and with these the rest of the data can be found in the Azimuth tables.

In the Azimuth tables, on the proper page, under the Declination for the date and opposite the apparent time, or hour angle, will be found the Azimuth of the body observed.

This Azimuth is the angle contained between the true meridian or true north and south line of the horizon, and the point where a line drawn from the centre of the 'Pelorus' would touch the horizon exactly under the centre of the sun, or other body, and this angle is the true bearing in degrees from 0° or north, and is reckoned east or west 180°.

CLARKE'S PELORUS.

Invented by Captain Wm. E. Clarke, Buffalo, N. Y.

Clarke's 'Pelorus' is what is called a 'shadow instrument.' Captain Clarke is a professional compass adjuster, his address being 59 Gold Street, Buffalo, N. Y. Captain Clarke contributes the following for the benefit of the users of the 'Pelorus.'

In arranging stands for the 'Pelorus' or in setting up a compass it is absolutely necessary that the center fore-and-aft line of the instrument shall coincide with the keel line so that correct courses can be computed. For it is the actual direction in which the ships keel points that all computations rest on as a base, such as leeway, variation, deviation, currents, etc.

Observations with the 'Pelorus' should be taken at least twice a watch and deviations noted in a book; thus data is secured which becomes valuable when celestial bodies cannot be observed. But a careful and observant navigator will secure much data which will be useful and which will take the place of celestial bodies when the weather is unfavorable for observations. Thus, I have frequently used, with good results, the illumination of the furnace at Lorain on dark nights, when turning the southeast shoal lightship, bound down Lake Erie. The bearing is 149° E, which, being used just as an azimuth of the sun, place it on the 'Pelorus' at the ship's head, and making the turn a little above the lightship watch the illumination through the sight vane and when abreast the lightship note where the short pointer is—it will point to the magnetic course the ship is making. The slight correction that may have to be applied will not be affected by deviation. Care must be taken in doing this to have the ship heading nearly right when abreast, because the angle changes quickly. The more distant the object observed, and the nearer it is to 90° from the course, the less chance for error.

TEST YOUR COMPASSES.

Bar point over stern, Bois Blanc over bow—N. by E.

Amherstburg range—N. by E. ⅜ E.

From Lime Kiln Crossing with Grosse Isle south channel range over bow—N. by W. ½ W.

On Grassy Island range—N. ⅛ E.

Mamajuda range—N. ⅞ E.

Grassy Island north channel range—NE. by N. ½ N.

Ecorse range—N. ⅛ W.

Range through Grosse Point cut—NE. ½ E.

Through St. Clair canal—NE. ⅛ N.

Russell Island lower range—NE.

Corunna range (Stag Island)—N. by W.

Point Edward ranges (Canadian)—N. ¼ E.

Frying Pan and Pipe island range—N. ⅛ W.

Winter Point range—NW.

Pilot Island range (leading up to Sailors' Encampment)—N. by E. ¾ E.

Dark Hole range (leading up through Little Mud Lake)—N. ⅛ W.

Stribling Point range (through dyke)—NW. by W. ⅝ W.

Lower Hay Lake range (from Dyke to Nine Mile point)—NW. by N. ¾ N.

Middle Hay Lake range (from Nine Mile Point to Six Mile Point)—N. by W. ½ W.

Fretchett point range—NW. N.

Up through Island Cut—N. NW. ⅛ W.

Bayfield Rock range (leading to the Soo)—W. NW. ⅛ W.

Vidal Shoal range (leading out of canal)—W. by S.

Point Aux Pins range—SW. by W.

St. Mary's River lower range (red)—W. by S. ¼ S.

St. Mary's River upper range (Point Iroquois over bow)—NW. by W. ¼ W.

Head of St. Mary's River range (leading out to Point Iroquois)—NW. ½ N.

Two good courses on Portage ranges:

Roleau Point range—NE. by N. ⅜ N.

Portage Lake Ship canal (entering into lower end of canal.)—N. by E.

THE USE OF THE BEARING INDICATOR.

Finding the Distance Off a Lighthouse or Other Object by Bearings.

When running along the land or passing lighthouses or other objects it is absolutely necessary that you should know the exact distance your vessel is from these objects and for this purpose a bearing indicator is required. A few simple rules for its use are given below. Of course if the speed of your vessel is not known then the distance run between bearings should be found by the taffrail log.

RULE 1.

Take a bearing of a lighthouse or other object on shore and see how many points it differs from the course you are steering. When this difference is doubled the distance run will be equal to the distance' your ship is from the lighthouse or other object.

EXAMPLE.

A ship steering north and running at a speed of twelve miles an hour. At 8 a. m. an object on the shore bore N. NW. The difference between this bearing and your course, therefore, was two points. Keep on the same course until the same object bore NW. The difference between this last bearing and the course steered would be four points or just double the difference of the first bearing. And we will say that the second bearing was reached at 8:30 a. m. Therefore the ship has run just a half an hour, or six miles, and your ship is just six miles from the object when the last bearing was taken.

RULE 2.—THE FOUR POINT BEARING.

If your course leads your ship parallel with the shore and you wish to know exactly how far off that shore your ship is then you should figure to get your second bearing directly abeam and for this purpose the four point bearing should be used. The four point bearing is on the same principle as that given in Rule 1.

EXAMPLE.

Get any object ashore to bear four points forward of the beam and run on the same course until the same object bears exactly abeam. The distance run between the two bearings will be the distance your ship is from the shore.

RULE 3.—THE CROSS BEARING.

The above rules can all be used without a chart, dividers or rulers; all that is necessary is the bearing finder and the timepiece. However, there are some excellent rules that have to be worked out on a chart. One of these is the cross bearing, or the taking of the bearings of two objects at the same time.

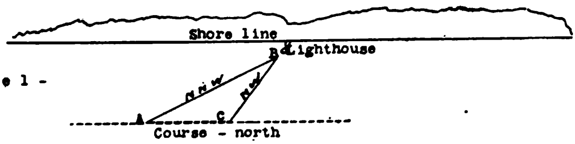
EXAMPLE.

Your ship is steering north and a lighthouse bears NW. You now find that another object ashore bears west. Draw these two bearings on your chart and the position of the vessel is at the point where the lines cross.

RULE 4.—THE TWO BEARINGS.

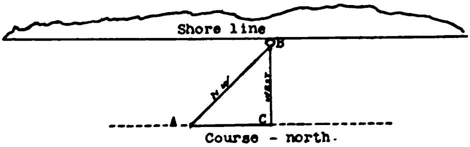
Take a bearing of a lighthouse or other object and draw this bearing on the chart; then run any distance, say a mile or so, and take another bearing of the same object and draw this bearing on the chart also. Then if you ran one mile between the two bearings set your dividers to the one-mile scale as shown on the chart; then set your dividers so that one point rests on each line of bearing, the dividers to be also standing on the ship's course. The points of the dividers will show the positions of the ship at each bearing.

Rule 1 -



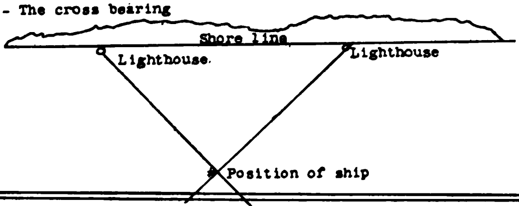
The distance from A.to C is equal to the distance from C to B .

Rule 2 - the four-point bearing

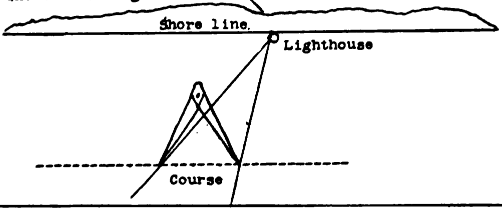


The distance from A to C is equal to the distance from C to B .

Rule 3 - The cross bearing



Rule 4 - The two bearing



HEIGHTS OF OBJECTS ABOVE LAKE LEVEL AND THEIR DISTANCES OF VISIBILITY.

The distances of visibility given in this table are those from which an object may be seen by an observer whose eye is at the lake level; in practice, therefore, it is necessary to add to these a distance of visibility corresponding to the height of the observer's eye above the lake level. For example, you pick up Thunder Bay Island light and then by reference to the lists of lights and fog signals you find that it is 60 feet high; therefore by the table printed below it would be visible, with the eye at lake level, a distance of 10.25 miles. But you have seen this light from the bridge of your steamer, 30 feet above lake level. By again referring to the table printed below you find that 30 feet brings a distance of 7.25; by adding the two results together—10.25 and 7.25—you get the distance from light as follows: 17.50 miles. Atmospheric conditions may sometimes increase or diminish the distances of visibility.

Heights in Feet	Distances	Heights in Feet	Distances	Heights in Feet	Distances
5	2.96	70	11.07	250	20.92
10	4.18	75	11.46	300	22.91
15	5.12	80	11.83	350	24.75
20	5.92	85	12.20	400	26.46
25	6.61	90	12.55	450	28.06
30	7.25	95	12.89	500	29.58
35	7.83	100	13.23	550	31.02
40	8.37	110	13.87	600	32.40
45	8.87	120	14.49	650	33.73
50	9.35	130	15.08	700	35.00
55	9.81	140	15.65	800	37.42
60	10.25	150	16.20	900	39.69
65	10.67	200	18.71	1,000	41.83

DECK AND ENGINE ROOM SIGNALS.

Great Lakes.

1 whistle or 1 bell,	Go ahead
1 whistle or 1 bell,	Stop
2 whistles or 2 bells,	Back
3 whistles or 3 bells,	Check
4 whistles or 4 bells,	Strong

Two whistles or two bells shall always mean back irrespective of other signals given.

Ocean Signals.

1 bell, if engines are stopped,	Ahead slow
Jingle bell additional,	Full speed
1 bell, if under full speed,	Slow down
2 bells, if under full speed,	Stop
2 bells, if engines are stopped,	Astern slow
Jingle bell additional,	Astern full speed

Whether going astern slow or at full speed, one bell always stops the engine.

If running under full speed, the engineer receives four quick bells, it will be understood as a signal of emergency and the engines will be reversed and sent full speed astern without waiting for the jingle bell.

HAND LEAD LINE.

2 fathoms,	2 strips leather.
3 fathoms,	3 trips of leather.
5 fathoms,	White rag.
7 fathoms,	Red rag.
10 fathoms,	Piece of leather with a hole in it.
13 fathoms,	Blue rag.
15 fathoms,	White rag.
17 fathoms,	Red rag.
20 fathoms,	2 knots.

DEEP SEA LEAD LINE.

10 fathoms,	Tucked strand with one knot.
20 fathoms,	Tucked strand with two knots.
30 fathoms,	Tucked strand with three knots.

and so on to 100 fathoms.

MISSISSIPPI SOUNDINGS.

In sounding the water in the Mississippi River they call out as follows:

Mark twain for 2 fathoms.
Quater twain for 2¼ fathoms.
Half twain for 2½ fathoms.
Mark three for 3 fathoms and so on.

NAVIGATION LAWS.

Navigation laws as adopted by the United States in 1792-3, have been in operation since that date with few changes or revisions. The laws contain the following provisions: No vessel, unless entirely built in this country and wholly owned and officered by Americans, is considered an American vessel having the right to be protected by the American flag. No foreign vessel is permitted to engage in the coasting trade, the same extending from Atlantic to Pacific. American vessels are no longer considered as such if even a part owner (with a few exceptions) resides abroad. Transfer of an American vessel to foreigners prohibits it from ever again sailing under the American flag. If an American vessel makes any repairs in a foreign port, duty must be paid on the value of all such repairs on her return to this country. The repairing of foreign vessels in our ports, with foreign materials, is placed under restrictions. Materials for the construction of vessels for foreign trade may be imported free of duty, but the duty must be paid if the vessel engages for more than two months a year in the coasting trade. American vessels may unload at any port of delivery in the customs district, but foreign vessels can only discharge their cargoes at a port of entry, which is a certain designated port in each customs district in the United States. Exceptions are made when they are laden with coal, salt, or similar merchandise in bulk.

THE SCIENCE OF MODERN NAVIGATION.

Navigation is the art of finding the geographical location of a vessel at sea, the most direct course to be steered in pursuit of the voyage, and the distance to be made.

There are two branches of the art—dead-reckoning and observation.

Navigation by dead-reckoning consists in actually measuring the courses and distances sailed by the ship, and from them computing the distance and direction from the port left and to the port sought.

Navigation by observation consists in measuring the angular altitude of celestial bodies above the horizon, and computing the position of the ship by the application of astronomical and mathematical laws.

The problems of dead-reckoning are solved by plane trigonometry; those of observation by spherical trigonometry. But as the trigonometrical data are all provided in the tables printed in epitomes of navigation, the mariner is not required to be acquainted with any higher mathematics than simple arithmetic.

The instruments used in dead-reckoning are the compass, log, and lead-line. The compass shows the direction in which the ship is traveling; the log measures the speed or the distance. The lead is used when on soundings to measure the depth of water and ascertain the character of the bottom. These data, referred to the chart, throw valuable light on the question of the ship's position. Approaching a coast in thick weather, or on a dark, cloudy night, the lead is the navigator's main reliance.

Until recent years very little attention has been paid by lake men to the finding of their ship's position by astronomical observations, but while 'coast piloting' and 'dead-reckoning' are first in importance on the Great Lakes, where the land is nearly always in sight, still all through lake pilots recognize the fact that a knowledge of the taking of astronomical sights is a great aid to safety. Nautical schools are being conducted in many of the large lake cities during the winter months and they are well patronized. Aboard a steel ship a compass is a very unreliable instrument but when the exact position of the ship can be found by observation, and laid down on a chart, the usefulness of this part of the art of navigation can be easily understood.

For the taking and working of astronomical sights there are required a sextant, a chronometer and a nautical almanac. The sextant is a light, handy instrument by means of which the angle between two objects may be measured. It carries two mirrors, of which one is capable of motion about a pivot, and the other is fixed. There is a telescope through which the observer looks directly toward one of the objects—the horizon; the movable mirror is then placed in such a position that a ray of light from the second object (the sun or other heavenly body) is reflected to the fixed mirror and thence, through the telescope, to the eye of the observer. When the one object, seen directly, and the other by reflection, appear to the observer to be in coincidence, the measure is made, and it only remains to read the amount of the angle from a graduated scale over which an index travels to make the position of the movable mirror on its pivot; and so nice is the graduation and so effective the method of reading that angles may be measured to the nearest ten seconds, or to $\frac{1}{360}$ part of a degree.

The chronometer is nothing more nor less than a time piece in which every known device is employed to insure absolute correctness. The finding of the ship's position is not possible without the perfect time and for this reason the navigator should get the best chronometer obtainable.

The "Nautical Almanac" is published annually by each of the more important maritime nations. In it are given tables by which the position of the sun, moon, planets and all fixed stars of material magnitude may be found for any instant throughout the year. The navigator who is supplied with this book, together with the sextant and a chronometer, has at hand all the means necessary for finding the vessel's position by means of the celestial bodies.

Suppose that a bird is flying through the air on a known course and in such manner that its position above the earth may be determined for any given instant of time; and suppose that at a certain moment an observer with a sextant and watch measures the altitude of the bird—that is, its angular height above the horizon—and simultaneously records the time. Now take as a center the point on the earth vertically below the bird, this point being known from the position as given by the time; and from that center draw a series of circles. If we consider any of these circles it may be seen that from every point of its circumference the bird will appear at the same angular distance above the horizon at the given instant; further, there will be one circle whose circumference contains our observer, and from every point of that circumference the altitude of the bird will be that which he measured. It is therefore clear that the observation has resulted in locating the observer upon one of a series of points which lie upon a certain circumference; but it has not defined the particular point. If, however, there is another bird flying in a known track, or if the observer waits while the first bird changes position somewhat, he may observe a second altitude and draw another circle that also takes in the position; then he will know that he is at one of the two points where those circles intersect, for if he is at the same time on both circles these are the only places at which the condition is fulfilled. At sea, the sun, moon and stars take the places of the birds with which we have just been dealing. The altitude of a celestial body is measured with the sextant and the time is noted with the chronometer; the chronometer correction being applied, the navigator knows the exact instant at which the observation was taken, which, from the information given in the Nautical Almanac, defines the position of the observed body with relation to the earth, taking account both of the daily rotation of the earth about its axis and of its annual rotation about the sun; and having located the body, a circumference may be determined which will, like that in the case of the bird, take in all positions at which the observed altitude is possible; so also may a second circumference be determined either by a second celestial body or by the same body at a later time, and the intersection of the two circles will give the position of the ship, due allowance being of course made in case there has been a change of position between the two sights.

Practically it is never necessary to deduce the whole circle for the circumference may be very large, taking in perhaps half the globe; the navigator need only work out an arc a few miles in length, for the vessel's position is always known within narrow limits from the dead reckoning; for a similar reason, there is never any question in the navigator's mind as to which of the two intersections represent the true position.

When the body observed is on the meridian the problem assumes a simple form, and hence it is an invariable rule, if the weather is clear, to take an observation of the sun when it attains its maximum altitude at noon, and to work up the day's run to that time and begin anew the dead reckoning.

Any heavenly body may be used for obtaining position, providing it shows with sufficient clearness to be observed through the sextant, and providing also that the horizon is in sight. Sights of the sun are more generally used than those of other heavenly bodies; indeed there are some navigators that seldom employ others; but in the fast moving modern steamers it is almost imperative to find the position more frequently than is possible by using the sun alone, and so the stars and planets (and occasionally the moon) are called into service.

Of course it is understood that it is not possible to take observations during foggy or cloudy weather; the navigator must then fall back on his dead reckoning. And for this reason there are many that argue against the finding of a ship's position by observation on the Great Lakes. They claim that a ship will sometimes run the entire length of a lake and not have a favorable opportunity for taking a sight, and that navigators that place much dependence in the taking of observations will not be as sure of themselves as if they had put their whole time to a thorough system of dead reckoning. But the navigator who is thorough enough to believe that it is necessary for him to know everything about the science of navigation, from A to Z, will be the most careful man of the two.

LATITUDE AND LONGITUDE.

Geographical terms used in specifying the position of places on the earth's surface.

Latitude.

Latitude is the angular distance of a place north or south of the equator.

Longitude.

Longitude is the angle at the pole between two great circles drawn on the earth's surface, passing through the poles, and touching respectively the place whose longitude is in question and the place selected as the origin of longitude.

LONGITUDE AND TIME.

The earth turns on its axis once in 24 hours; that is, an entire circumference, or 360° of longitude, passes under the vertical rays of the sun in 24 hours. When the sun's rays are thus vertical on a meridian, it is 12 o'clock noon at every place on that meridian; and since the earth turns from west to east, noon has passed for that day at places east of the meridian, and at places west of it noon has not yet come.

A rotation of 360° in 24 hours = 15° in 1 hour.
" " " 15° or 900′ in 60 minutes = 15′ " 1 minute.
" " " 15′ or 900″ in 60 seconds = 15″ " 1 second.

That is, the earth, in a given number of hours, minutes, or seconds, rotates through 15 times as many degrees, minutes, or seconds, of longitude, respectively.

MERIDIAN AND STANDARD TIME.

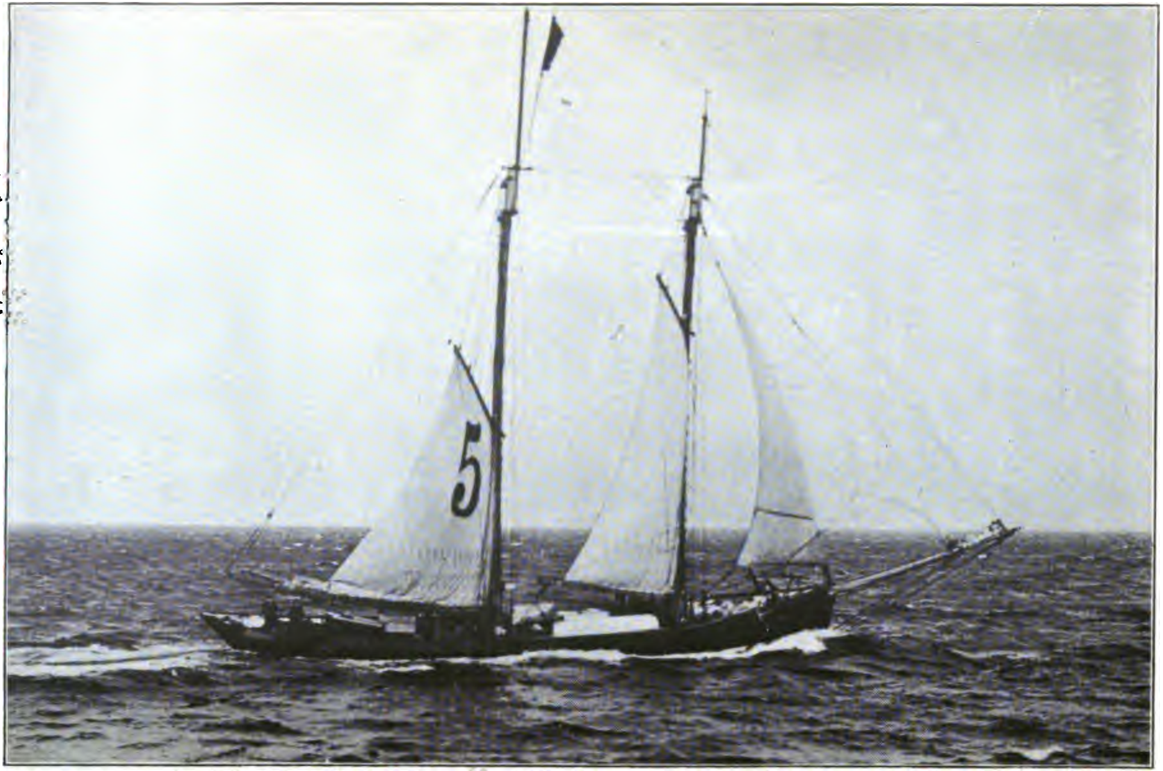
A watch that shows correct time at any given point, is 4 minutes slow at a point one degree east, and 4 minutes fast at a point one degree west.

To remedy this difficulty, the principal railroads of the United States and Canada, in 1883, adopted the time of four different meridians, 15° apart, as the standard time for four sections embracing the entire width of both countries. The most eastern of these is the meridian of 75° west of Greenwich; the others being the meridians of 90°, 105° and 120°.

All places between the Atlantic coast and a line extending from Detroit through Pittsburg, Wheeling, Parkersburg, Augusta and Charleston have the time of the 75th meridian, called Eastern Time.

All places between the western boundary of the Eastern Time section and a line from Bismarck through North Platte, Dodge City, etc., to the City of Mexico have the time of the 90th meridian, called Central Time, one hour earlier than Eastern Time.

Roughly, the Rocky Mountain region has the time of the 105th meridian, 2 hours earlier than Eastern Time, and called Mountain time; and the Pacific slope has the time of the 120th meridian, 3 hours earlier than Eastern Time, and called Pacific Time.



A PILOT BOAT TAKING A PILOT OUT TO AN OCEAN STEAMER

APPARENT AND MEAN TIME—THE EQUATION.

Apparent time is that shown by the sun. Mean time is that shown by the clock.

The equation of time is the difference between them.

The earth revolves on its axis once in 24 hours, and theoretically the sun crosses the meridian of any given place at precisely 12 o'clock each day, and it is then noon. As a matter of fact this is not so. The earth does not revolve at a uniform rate of speed, and consequently sometimes the sun is a little ahead of time and again it is behind.

Now you cannot manufacture a clock which will run that way. Its hours must all be of exactly the same length, and it must make noon at precisely 12 o'clock every day. Hence we distinguish clock time from sun time by calling the former mean (or average) time and the latter apparent.

Your chronometer shows Greenwich mean time.

Your cabin clock should show local mean time.

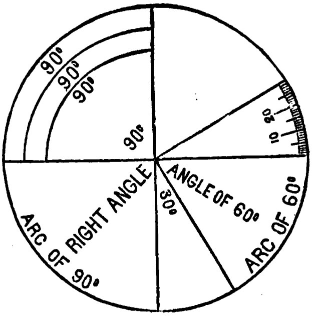
The sun always gives local apparent time.

CIRCULAR MEASURE.

60 seconds ($''$) = 1 minute, . . . $'$
60 minutes = 1 degree, . . . $^\circ$
360 degrees = 1 circumference, *C.*

Note 1. If the circumference of a circle be divided into 360 equal parts or arcs, each arc is a degree; 90 of these arcs are equal to ¼ the entire circumference.

Note 2. If from the ends of an arc of 90°, lines be drawn to the center of the circle, a right angle will be formed. Four right angles occupy all the angular extension around the center of the circle.



Note 3. An angle of 1° is always the same, but an arc of 1° varies in length as the size of the circle varies. An arc 1° of the circumference of the earth at the equator has a length of 69.164 miles very nearly and 1 minute is equal to 1.1537 + miles, called a geographical or nautical mile.

Meridian.

Any great circle of a sphere passing through the poles.

The Prime meridian is the one from which longitude is measured.

In 1882 the United States Congress passed a joint resolution authorizing the president "to call an international conference to fix and recommend for universal adoption a common prime meridian to be used in reckoning longitude, and in the regulation of time throughout the world." The conference assembled in Washington, October 1st, 1884. Delegates representing twenty-six countries were present, but they were not able to agree unanimously upon a prime meridian. However, most of them favored the adoption of Greenwich, England, as the origin of longitudes. The French delegates represented the only important nation that would not agree; and at present French authorities and navigators still reckon from Paris. But all other important nations now count from Greenwich, and in this number the United States are included.

Azimuth.

A point in the horizon.

In astronomy the azimuth of a heavenly body is the angle measured along the horizon between the north and south point, and a point where a circle passing through the zenith and the body cuts the horizon.

Zenith.

That point in the heavens that is directly overhead the observer.

Horizon.

The circular line formed by the apparent meeting of earth and sky.

Amplitude.

The angular distance of a heavenly body, at the time of its rising or setting, from the eastern or western point of the horizon. When the sun is in the equator (i. e., at the time of either equinox) it rises exactly east and sets exactly west. Therefore at this time the amplitude of the sun is 0. His amplitude is at the maximum in midsummer and again in midwinter. The amplitude of a fixed star remains the same all the year around.

MARINE INSURANCE.

Marine insurance is commonly called marine underwriting and a marine insurance agent is generally called an underwriter. No one underwriter assumes very large risks, a ship and cargo being usually insured by a large number of firms. The objects most commonly insured under a marine policy are ship, cargo, and freights. Sometimes other objects are covered such as the expected profits of the voyage, or more frequently, the liability for damages on account of collision. Vessels are insured against perils of the sea such as wind and wave, fire, collision, stranding, jettison, etc. The different kinds of policies are:

Voyage policies.—A policy in force from one specified port to another.

Time policy.—A policy in force for a specified time.

Open policy.—This policy provides that in case of total loss the amount of indemnity shall be determined by ascertaining the amount of loss actually suffered.

Valued policy.—This policy provides that in case of total loss the amount stated in the policy shall be regarded as the value of the insured property, and paid as indemnity.

When a vessel is proven to be a "constructive total loss" the owner can abandon to the underwriters. A vessel is a "constructive total loss" when the damage exceeds half her value. The full amount of her insurance can then be collected, the vessel then becoming the property of the underwriters.

Partial losses (less than constructive total losses) are called average. Average is divided into general and particular average.

Average—An Example.

A vessel goes ashore in an exposed position; to hasten her release before she is damaged by bad weather it is found necessary to throw part of her cargo overboard. The vessel is then released, uninjured. But although the vessel is not injured the insurers of the vessel agree to stand part of the loss occasioned the insurers of the cargo as the cargo was thrown overboard to save the vessel. This is called General Average.

But on the other hand, if the same vessel had lost or damaged part of her cargo in a storm the insurers of the cargo would have to stand their loss alone. This is Particular Average.

For a thorough treatise on Marine Insurance I would refer the reader to Gows 'Marine Insurance.'

THE BAROMETER.

The most difficult part in the study of the barometer is getting the first insight into it. Many give up in disgust after a few months trial and conclude that it is very uncertain instrument. Weather men may smile at my unscientific way of putting things but my remarks are intended for the beginner, put in a way that I hope will be easily understood by the beginner.

Of the many books and papers that are written on the barometer and the study of the weather, I do not know of one that is of the least value to the beginner. Many of them serve only to puzzle him and after reading these books and watching his glass, he wonders how he is to tell whether his barometer is falling for rain or wind or rising for fine weather or easterly or northerly weather. My belief is that, as a foreteller of weather in itself alone, the barometer is of no value to anyone; but closely watched in conjunction with the wind and rain at the time, it is very valuable. No good results can be obtained with the barometer without the use of a thermometer and by paying strict attention to the warmth and coldness of the atmosphere.

The first step in the study of the barometer should be to know exactly what a barometer is and how it is constructed. The barometer is simply an instrument for measuring the weight of the atmosphere. When weather conditions are perfect and no storms are approaching, the pressure of the atmosphere in this part of the country will be about 14 $\frac{7}{10}$ pounds to the square inch. Inequalities in temperature cause the air to flow away from a certain part and the pressure is reduced. Just as water will flow back and find its level, so the air will rush back to fill up the vacuum, and the greater the vacuum, the stronger will be the rush to fill it. This moving air is called wind. The barometer measures the weight of the atmosphere and in this way storms are foretold. The original barometer was one in which the height of a column of mercury, sustained by atmospheric pressure, was the measure used. And although the Aneroid barometer is the one most commonly used, the mercurial barometer is still taken as the only reliable standard for exact observations. The normal pressure of the atmosphere will hold a column of mercury up in a glass tube just 30 inches. Therefore the glass column of the original barometer was marked off in inches—reading from 25 up to 31. The pressure of the atmosphere would never lower the column to less than 25 inches and would never raise it to more than 31 inches. Therefore the face of the Aneroid is marked off in the same way—from 25 to 31.

The Aneroid barometer is a French invention. The outside case is built of brass and in the form of an ordinary alarm clock, with a dial and a pointer on its face. Inside, and fastened to the back of this case is a circular metal box, about the shape of a tin shoe polish box. The sides of this little box are corrugated to make it more elastic. The air is forced out of this box and it is then soldered air-tight. Having no air inside, the outside air pressure would cause the two sides of this box to press together if they were allowed, but they are kept apart by a strong spring. This spring connects with a mechanism that operates the index hand and when the pressure of the air increases or diminishes, the sides of the little corrugated box contract or expand and the index hand will raise or lower. As said before, the face of the dial is divided into seven parts, called inches, beginning at 25 and reading up to 31. These inches are again subdivided into ten parts and marked from 1 to 10. But instead of reading these as 1, 2, 3, etc., they should be read as 10, 20, 30, etc. If the index hand points to the figure 4, between 29 and 30, it reads 29.40. In the lake region the hand usually works between the figures 29 and 30. Only a few times during the season of navigation will the hand point below the 29; very rarely reaching as low as 28.50. The hand never points from the figure 30 around to the right and up to 28, in this part of the country. And the words, 'stormy,' 'rain,' 'change,' 'fair,' and 'very dry,' are of no use and should not be put on a barometer, as in this part of the country in all kinds of weather, the hand works almost wholly under the word 'change.' In some parts of the world the air pressure varies a little and then some of the other figures on the barometer can be used. The barometer can also be used for measuring the heights of mountains as the air pressure gets less as we go up. The barometer hand will fall about one-tenth of an inch for each 100 feet of ascent. For example, if the barometer reads 30 at the base of a hill, it would read 29.90, when an ascent of 100 feet had been made.

Now as said before, when weather conditions are perfect and no storms are approaching, the air pressure is about $14 \frac{7}{10}$ pounds to the square inch. The barometer should then read 29.60 or very nearly. The first sign of a coming change is when the hand begins to lower. Beginners are often puzzled by the statement that the hand lowers for southerly winds and rises for northerly and easterly winds.

They cannot understand how a barometer can rise for both fine weather and easterly gales. I have watched the barometer and the weather closely for a good many years and my experience has been that a barometer must first lower, before you will get any kind of a storm. If weather has been fine for several days and the barometer has been standing at about the proper place (29.60) a rise will not foretell easterly or northerly stormy weather. Under the above conditions I have seen the barometer go higher and higher until it pointed to almost 30, and still the weather was perfect. There was just too much air at that place and the barometer registered it. But on the other hand, if the weather was perfect and the hand began to get lower and lower until it might be as low as 29.20, or even down to 29, and then without any wind at all excepting light variable breezes, the hand begins to rise rapidly, you can safely look out for easterly storms. The severity of the coming storm can be judged by the amount of fall of the hand and the velocity of its fall and rise. Often the worst part of the gale is raging even while the hand has returned to 29.60. But in most of these severe easterly gales the hand, after rising to a high point will again lower, often to a very low point. This is a good sign that the gale will back up and blow strongly from the north-west. Now the storms that are most commonly met with on the Great Lakes are those that begin in the southward and end up in the west or northwest. As a general thing, severe storms, are not met with during May, June, July and August. For example we will take the month of August, (by some called a doubtful month). Your barometer is falling slowly and at midnight rain sets in and continues until daylight. Your barometer has fallen to 29.40 and you now find it steady or rising. A short time afterward, as you expected, the rain will cease and fine weather will come again. But if your find your barometer falling rapidly and the wind in the southeast quarter, you may rest assured that it will amount to something more than rain, and by the depth of its fall and the rapidity with which it falls, you can judge the force of the coming westerly gale. The wind and the rain will both increase, probably changing now to south and getting warmer. The wind now dies out and the rain comes in torrents. With this dead calm the hand goes lower and lower (in ordinary gales the hand wil go as low as 29.20, in severe gales it goes to 29.00 and in some cases still lower. I have seen the hand go down to 28.60. This greath depth is reached probably only once during the season of navigation.) A sudden clearing up in the west will show the direction from which the worst part of the gale will come. The gale then commences from some point between southwest and north and blows a dry gale while the sky clears. No settled weather can come until the hand has reached its normal position of 29.60 or higher. If the gale dies out and the barometer has risen to only 29.20 or even up to 29.40 and then stopped rising, you can expect the gale to return, perhaps suddenly and with increased force. And here is where the thermometer comes in. If the thermometer rises, the returning gale will come from the southward, and if it falls, then the gale will be from the northwest or north. But bear in mind—in the above kind of storms, the barometer must read at least 29.60 before good weather can again be expected.

And right here let me say that you must be sure that your barometer is set right. A barometer should be set every few months. You can get it set at any weather office, free of charge. It is useless to proceed farther in the study of the barometer unless your instrument is perfect. It is not necessary to hang your barometer in the open. They usually are kept in a room and are affected but little by a sudden change of temperature. The hand might lower just a trifle by being taken from a heated room into the open. Now there are a great many other conditions of the atmosphere that will affect your barometer in other ways but these can all be learned by experience. Close attention should also be paid to the appearance of the sky and other signs of settled and unsettled weather. During a wind storm, when rapidly moving clouds are moving with the wind, if there are also high upper clouds moving in the opposite direction, it is generally a sign of severer weather.

If the wind is blowing cold from the northward and it gets warmer, it is usually a good sign that southerly winds will follow. The old proverb that

> 'When the wind veers (back) against the sun,
> Trust it not, for back it will run,'

does not always apply to storms on the lakes. The proverb means that if the wind is in a certain quarter and works around to the left, it will not stay there long but will again shift to the former quarter. But most of the severe northeast gales will back to the north or northwest and blow out there, without returning to the northeast.

A FEW DEFINITIONS.

Displacement.

Displacement is the weight of a ship, determined by the amount of water it displaces.

Gross Tonnage.

The gross tonnage of a ship is the cubical measurement of all enclosed spaces. The gross tonnage is found by dividing by 100, the whole interior capacity—expressed in cubic feet—of the hull of a ship and her enclosed deckhouses. This method presumes that an average cargo of light weight freight would require not far from 100 cubic feet for each ton of actual weight.

Net Tonnage.

Net tonnage is derived from gross tonnage by deducting the capacity of all spaces not used, or capable of being used, for cargo or passengers.

In the United States the term 'enrollment' is used with reference to vessels engaged in the coasting and home trade, which are 'enrolled' while those employed in foreign trade are 'registered.' The two names are used merely to distinguish between the two certificates.

Seamanship.

Seamanship is the science and art of rigging, equipping, maneuvring, and handling a ship or boat under all conditions.

Articles of Agreement.

Shipping articles are articles of agreement between the master of a ship and a seaman serving on board her in regard to wages, length of service, kind of service, etc.

Tides.

Tides are caused by the gravitational attraction or pull of the moon upon the water. When the moon is directly over a place it pulls the water under it and this tends to heap up a tidal wave directly under the moon.

There are no tides on the lakes.

The rising of the tide is called the flood of the tide.

The falling of the tide is called the ebb of the tide.

Friday.

A day of the week once held in superstitious awe by seamen. They believed that to start a voyage on Friday would bring calamity to both vessel and crew. However several steamship companies owning passenger steamers have adopted Friday as the regular sailing day for their steamers.

Jimmy Square-Foot.

A sailor's name for the devil.

A FEW SAILORS' PHRASES FOR THE BEGINNER.

ABAFT—In the direction of the stern.

ABREAST—Side by side, opposite.

AHOY—A term used in hailing a vessel.

AMIDSHIPS—Any place on or below decks that is in the center of the vessel, whether in reference to the length or breadth.

ANCHOR LIGHTS—Lanterns hoisted on each end of a vessel when lying to an anchor or at a dock.

ANCHOR WATCH—A sailor is standing his anchor watch when he is on duty when the vessel is at an anchor.

ATHWART—From side to side.

AVAST—An order to cease, as ‘vast heaving’ vast ‘hauling,’ etc.

BELAY—To make a rope fast to a pin or other object.

BIGHT—Any part of a rope except the ends.

BILGE—That part of the bottom of a vessel that is next to the keel.

BINNACLE—A stand of wood or brass for the compass to rest in.

BITTS—Perpendicular timbers for making lines fast to (often called timber heads.)

BOXING THE COMPASS—Calling off the names of the 32 points of the compass.

BULKHEADS—Partitions dividing various parts of the vessel.

BULWARKS—The fence built around the vessel over the covering board.

BUNKERS—Apartments for the steamer's fuel.

BURTON—A tackle used for various purposes, such as cat-heading the anchor, etc.

CAULK—To stop leaks. To drive oakum into the seams. (Generally pronounced cork.)

CAREEN—When a vessel lays over on her side she is said to careen.

CENTRE BOARD—The board which works up and down in the centerboard box, passing through a narrow opening in the keel of a vessel. It is lowered to keep a vessel from drifting sideways (to leeward) when running without cargo.

CLEARANCE—When a vessel is ready to start on her voyage, the customs officer must furnish her with a clearance document without which she must not attempt to leave port.

CLEW—The two lower corners of square sails, and the after lower corner of a fore-and-aft-sail.

CLINKER—A style of building boats in which the lower edges of one plank overlap the top edge of the one below it.

COAMINGS—Strictly speaking, coamings are the fore-and-aft framings in the hatchways, and the thwartship pieces are head-ledges, but the name coaming is commonly applied to the entire raised framework about the openings in the deck.

DAVY JONES—A title applied to a mythical sea-devil, whom is supposed to take charge of all sailors after death.

DAVY JONES' LOCKER—Infernal regions at the bottom of the sea where Davy Jones holds court.

DEAD LIGHTS—Round thick glass windows in the side of the vessel.

DEVIL'S CLAW—A strong iron hook used as stopper for the anchor.

DITTY BAG—A small bag used on shipboard to hold needles, twine, .etc.

ENROLLMENT—A document issued to vessels by the customs officers.

EVEN KEEL—When a vessel is evenly balanced in the water she is said to rest on an even keel.

FALSE KEEL—A timber fastened underneath the main keel of some vessels—generally on ocean vessels.

FID—A pointed piece of hard wood used as a marlin spike for splicing large ropes.

FISH HOOK—The large iron hook used to catch the arm of the anchor, and by which the fluke is raised to the rail.

FISH TACKLE—The tackle used in raising an anchor.

FLOTSAM—Wreckage floating on the water.

FLYING JIB—One of the head sails of a vessel.

FORE—The forward part of a vessel; anything in the direction of the head of the ship.

FORE FOOT—The forward extremity of the keel, upon which the stem of the vessel rests.

FORE-PEAK—The part of the vessel below decks which is close to the stem.

FORECASTLE—The compartment in the forward part of a vessel in which the seamen sleep.

FREEBOARD—The distance from the covering board to the water-line.

FURL—To roll up or secure a sail or awning.

GAFF—A spar which projects abaft a mast and to which a fore-and-aft sail is bent.

GALLEY—A ship's kitchen.

GANGWAY—The opening or door through the bulwarks.

GARBOARD STRAKE—The first line of planking next to the keel.

GRAPNEL—A small anchor with three or four prongs used for dragging on the bottom of the lake or sea and finding lost articles.

GUNWALE—The rail of a small boat (pronounced gun-nel.)

HALYARDS—Tackles used for hoisting and lowering sails, yards, etc.

HARD-OVER—The helm is 'hard-over' when it is put either way as far as it will go.

HAWSE PIPE—An iron pipe in a vessel's bow through which the anchor chain runs.

JACK—The universal name for a sailor.

JAW—The inner end of a gaff or boom—the end next to the spar.

JAW-ROPE—The rope that secures the jaw to the mast.

JET-SAM—Goods thrown from a vessel and found floating.

JIBE—To shift the booms and sails from one side of the vessel to the other in sailing.

JONAH—Any member of the crew or one of the passengers, who is blamed for bringing bad luck. The old fashioned sailors always considered that preachers and women were Jonahs and considered it very unfortunate to be obliged to sail in such dangerous company.

KEEL—The first timber laid down in building a vessel. The backbone of the ship.

KEELSON—A timber bolted on top of the keel above the floor timbers.

LAZARETTE—A compartment in the after part of a vessel used for supplies, etc.

LAZY-JACKS—Lines hung from the lifts, their purpose being to fold the sail as it is lowered.

LEACH—The edge of a square sail at the sides, but the after edge of a fore-and-aft sail.

LEAD—A lead weight with a line attached, used for finding the depth of water.

LEEWARD—The lee side, opposite to windward.

LIST—When a vessel leans over to either side she is said to have a list, but this term is not used when the vessel is borne over by the wind.

LOG—An apparatus for measuring the distance a ship has traveled.

LOG-BOOK—A journal usually kept by the mate, noting the courses, winds and all matters of importance in relation to the navigating of a vessel.

LONG-LEGGED—A vessel having a great draft of water.

LUBBER—Green hand on ship-board.

LUBBERS LINE—A black vertical line painted on the inside of a ship's compass bowl.

LUFF—The forward edge of a fore-and-aft sail. A vessel is luffed by putting her helm to leeward and bringing her to the wind. The luff of the bow is the place where the rail begins to curve towards the bow.

MANIFEST—A document signed by the master and given to the customs authorities, showing to what ports the cargo is destined, etc.

MARLIN—Tarred spun-yarn.

MARLIN SPIKE—A pointed iron instrument used in splicing.

MOOR—A ship is moored when she has two anchors down.

OFFING—A distance to seaward.

OUTBOARD—The outboard side of a vessel is the side away from the dock.

PALM—A shield for the hand which acts as a thimble for the sailor when sewing canvass.

PARCEL—To wrap strips of canvass around rope.

PINTLE—The bolt projecting from the bottom of a rudder and through the shoe.

PLANK SHEERS—The covering board.

PORT—The left-handed side of a vessel looking forward.

PORT TACK—The vessel is on her port tack when the wind is blowing on her port side when she is beating her way.

QUADRANT—An instrument for measuring altitudes.

QUARTER—That part of a vessel's side near the stern.

RAKE—The inclination of a vessel's spars or smoke stack.

RATLINS—Ropes acting as rounds of the ladder that is formed by the rigging.

REEF—To fold up part of a sail is to reef it.

RUDDER—An instrument for steering a vessel.

SADDLES—Pieces of wood bolted on the sides of spars to receive the weight of the boom jaws.

SCUPPERS—Holes cut through the bulwarks or through the covering board to allow water to run off the decks.

SCUTTLE—A small hatch in a vessel's deck.

SEAMS—The spaces between the planks of a vessel's sides and decks.

SELVAGEE—Rope yarns made into a strop.

SENNIT—Rope yarn or spun yarn braided.

SERVE—The act of covering a rope by winding small line or yarns around it.

SHANK—The main piece of an anchor.

SHEAR—The upward curve of a vessel's decks and rails.

SHEAVE—The wheel within the shell of a block.

SHEEP SHANK—The knot used for shortening a rope.

SHEER STRAKE—The line of planking on a vessel's side upon which the covering board rests.

SHROUDS—The stays or guys that support the masts.

SIDE LIGHTS—The vessel's colored lights.

SIGNAL HALYARDS—The small halyards running to the tops of the spars, used for hoisting signals or flags.

SIREN—One kind of a fog whistle.

SKIPPER—The captain.

STARBOARD TACK—A vessel is on the starboard tack when she is beating with the wind on her starboard side.

STAYSAILS—Sails which are hoisted on stays.

STROKE OAR—The oarsman who sits nearest the stern. The other oarsmen keep time with him.

SURF—The waves breaking on a shelving shore,

TACK—To go about. To turn the boat so as to get the wind on the opposite side.

TACKLE—A purchase of ropes and blocks. Pronounced taycle.

TAFFRAIL—The rail around the stern of a vessel.

TARPAULIN—Canvass coverings for hatches.

TAUT—Tight.

THOLE PINS—Pins fitting in holes in the gunwales of boats to keep the oars in position when rowing. Used for the same purpose as rowlocks.

THROAT—The inner end of a gaff where the throat block is hooked.

THWARTS—The seats extending across a small boat.

TILLER—The bar fitted into the head of the rudder, by turning which the rudder is moved.

TIMBER HEADS—Posts for making lines fast to.

TOPSIDES—The sides of a vessel from the water line to the bulwarks.

TRESTLE TREES—The timbers that support the cross trees on a spar.

TRIATIC STAY—The wire stay connecting the tops of spars.

TRUCK—A round piece of wood on the peak of a spar, just under the ball.

UNFURL—To unroll.

WAKE—The track left by a ship.

WATCH TACKLE—A handy tackle formed of a double and single block.

WATERLOGGED—When a vessel is filled with water, yet afloat owing to the buoyancy of her cargo, she is said to be waterlogged.

WEATHER SIDE—The side the wind blows on.

WHEEL HOUSE—The house containing the wheel that steers the vessel.

WIND A SHIP—To 'wind a ship' means to put her head where her stern was.

WINDLASS—The machine that lifts the anchor.

WING—That part of the hold next to the side.

YAWL BOAT—Generally a ship's life boat.

WAVES.

The height of a wave is measured from trough to crest and though waves as seen from the deck of a vessel appear to be enormous, their height is generally over-estimated. According to the Scientific American, in an ordinary gale on the ocean in deep water, waves seldom exceed 15 to 20 feet in height. In a very heavy gale of some days' continuance they will, of course, be much higher.

One authority observed them 30 feet high in the North Atlantic; another measured waves 22 feet in the South Atlantic. But the highest waves have been reported off the Cape of Good Hope and Cape Horn, where they have been observed on rare occasions, from 30 to 40 feet high.

But waves of 12 to 14 feet in the shallow waters of the lakes are generally more trying to vessels than the large waves in deeper water. It is generally assumed that a distance from crest to crest of 150 to 350 feet in the storm wave gives a velocity (in the change of form) of from 17 to 28 miles an hour. But what is required in the computation of the velocity is the period of passage between two crests. Thus a distance of 500 to 600 feet between two crests, and a period of 10 to 11 seconds, indicates a velocity of 34 miles an hour.

HOW DEEP IS THE OCEAN ?

One hundred and twenty feet is the limit fixed by the British Admiralty to which a diver may venture with safety into the sea. It is true, however, that the great diver Erostable once salved treasure at a depth of one hundred and seventy-one feet, and Ridyard at a depth of one hundred and sixty feet. One other diver, the famous Lambert, also salved half a million dollars' worth of treasure at a depth of one hundred and sixty feet, but he was injured for life in ascending the last time. The deepest dive ever attempted was two hundred and four feet, but the man who made it was killed by too rapid an ascent.

When compared with the measured depths of the ocean these figures seem trifling indeed. More than half the surface of the globe is hidden under water two miles deep; seven million square miles lie at a depth of eighteen thousand feet or more. Many places have been found five miles and more in depth. The greatest depth yet sounded is thirty-one thousand two hundred feet near the island of Guam.

If Mount Everest, the world's highest mountain, were plucked from its seat and dropped into this spot the waves would still roll two thousand feet above its crest.

Into this terrific abyss the waters press down with a force of more than ten thousand pounds to the square inch. The stanchest ship ever built would be crumpled under this awful pressure like an egg-shell under a steam-roller. A pine beam fifteen feet long, which held open the mouth of a trawl used in making a cast at a depth of more than eighteen thousand feet, was crushed flat, as if it had been passed between rollers.

The body of the man who should attempt to venture to such depths would be compressed until the flesh was forced into the interstices of the bone and his trunk was no larger than a rolling-pin. Still, the body would reach the bottom, for anything that will sink in a tub of water will sink to the uttermost depths of the ocean.—From the Ocean.

SOUNDING THE LOWEST DEPTHS.

The old belief that vessels which foundered in mid-ocean only sank to a certain depth and there floated about, suspended between the surface and the bottom, has no foundation in fact. Nor do wrecks lie in a picturesque tangle on the bottom, the hiding-place of strange fish throughout the ages, as another popular belief has it. Everything made by human hands is crushed and dissolved under the resistless weight.

Despite the impossibility of traversing the depths of the ocean, man's ingenuity has found means to lay bare their secrets. Sounding-machines, with wire so fine that five miles of it, with the drum on which it is wound, weigh but one hundred and forty pounds, measure the depths accurately and register the results on a dial. In the deeper places, from two and a half to three hours are required to make a single cast.

Thermometers attached to such wires will record the temperature at the bottom or any desired depth above, provided they are not crushed by the enormous pressure, as very frequently happens. A bronze water-bottle invented by Captain C. D. Sigsbee, of the ill-fated Maine, can be sent to the bottom, filled with water there, sealed, and returned to the ship by the same means. Dredges, trawls, and tangle-bars can be dropped to the bottom to gather specimens of the creatures that live in the depths and of the floor which supports the world of waters.

The dredge, or beam-trawl, is a sort of bag-net which is weighted and dragged along the bottom. No fewer than eight hundred fish have been brought up at one haul from a depth of two miles in Bering

Sea. No deep-sea fish more than five feet long has yet been taken though this is by no means accepted as conclusive evidence that no larger ones exist. The deepest haul in which animal life was obtained was made by the United States Fish Commission steamship Albatross near the Tonga Islands at a depth of twenty-five thousand feet, or nearly five miles. Ten hours were required to make this cast.

It seems to be established that the greater the depth of water the fewer the species of life in it. Yet it is not so wonderful that two thousand and fifty species should be found at depths ranging from six hundred to three thousand feet against two hundred and thirty-five species at depths in excess of three miles as that any sort of life should be found under such an enormous weight of water. Strangely enough, some creatures which in shallow water attain a size of but two or three inches in diameter are found in the "deeps" two or three feet in diameter. Some strange sea-spiders have been taken from the lower depths with legs a foot or more long.

His Serene Highness Albert I, Prince of Monaco, has hit upon a scheme for studying life in the depths of the ocean which has been as successful as it is ingenious. In pursuit of his hobby, oceanography, the prince makes long cruises in his yacht, which is equipped with a complete whaling outfit and carries several expert whalemen. Whales, grampuses, and other large creatures of the ocean are hunted in order that the contents of their stomachs may be examined. In this way some specimens that might otherwise never have been known to exist have been found. The prince has also done much important work along more conventional lines.

AN OLD-FASHIONED WAY OF FINDING THE LEEWAY A VESSEL IS MAKING.

(From Barnett's Coast Pilot, Published 1884.)

Take a compass, compare it with the compass in the binnacle, place it on the taffrail with the lubber point forward and parallel with the compass in the binnacle; observe the wake of the vessel; if the vessel is making leeway, the vessel will be to leeward of her wake and the compass course that points to the wake, will show the leeway. This is simple and can be done in any weather, and is near enough for all practical purposes.

AURORA-BOREALIS (Northern Lights.)

The name given to the luminous phenomenon, which is seen towards the north by the inhabitants of this country and towards the south by those living near that part of the earth. No definite cause has yet been discovered from the Northern Lights and many theories have been advanced, one of the oldest being that it is caused by the reflection of the sun on the ice of the Arctic regions. However, this belief is not borne out by facts. Astronomers prove a connection between the Northern Lights and the magnetism of the earth as when the Northern Lights occur, the compass needle is sometimes affected. Navigators sailing in different parts of the world have reported deviations of the needle during a display of Northern Lights.

WATER.

H. 2 O.—Hydrogen 2 parts, oxygen 1 part.

Fresh water freezes at 32 above zero. Salt water freezes at 28 below zero.

Fresh water boils at 212 above zero, salt water boils at 213½ above.

Water is only slightly compressible; it expands one eleventh when frozen.

One U. S. standard gallon of water weighs 8⅓ pounds.

One U. S. standard gallon of water contains 231 cubic inches.

One cubic foot of water contains 1728 cubic inches.

One cubic foot contains 7½ gallons.

One cubic foot of fresh water weighs 62½ pounds.

One cubic foot of salt water weighs 64 pounds.

One cubic foot of ice weighs 57½ pounds.

Eight cubic feet of ordinary snow makes one cubic foot of water.

One ton of fresh water contains 224 gallons.

One ton of fresh water contains 36 cubic feet.

OCEAN WATER.

Ocean water is salt and has a peculiar bitter taste.

A given volume of sea water will weigh more than the same volume of fresh water.

One hundred pounds of average ocean water contains about 3½ pounds of dissolved salts.

Of the solids in ocean water, about 77 per cent. is common salt, 10 per cent. magnesium chloride, 10 per cent. sulphates, and traces of nearly every known mineral.

The amount of salt in ocean water varies in different parts of the world. A cubic foot of ocean water from the tropics will weigh more than the same amount from the north Atlantic. No doubt this difference is caused by the evaporation of water in the tropics.

Salt water ice in salt water floats with only one-ninth of its mass above water. Fresh water ice in salt water floats with one-eighth of its mass above water. Fresh water ice in fresh water floats with one-tenth of its mass above water.

It is claimed that fresh water does not readily mix with salt water. According to Allingham's "Manual of Marine Meteorolgy," off the Amazon river fresh water is discovered floating on the surface of the ocean several hundreds of miles from the land. After heavy rains the water collected from the surface of the ocean has proved to be nearly fresh.

The fresh water of the St. Lawrence river joins onto the salt water about 30 miles below Quebec; or rather salt water first becomes noticeable there.

STEAM.

A cubic inch of water evaporated under ordinary atmospheric pressure is converted into one cubic foot of steam (approximately).

27.222 cubic feet of steam weigh one pound .

13.817 feet of air weigh one pound.

The best designed boilers, skilfully fired, will evaporate from 7 to 10 pounds of water per pound of first-class coal.

On one square foot of grate can be burned on an average from 18 to 20 pounds of soft coal, or 10 to 12 pounds of hard coal, per hour, with natural draft. With forced draft nearly double these amounts can be burned.

Locomotives average a consumption of 3,000 gallons of water per 100 miles run.

HORSE POWER OF ENGINES AND BOILERS.

The term 'horse power' came into use with the building of the first engine. Watt figured the general traveling gait of a horse to be five miles an hour or 440 feet per minute, and that the horse exerted an actual power of 75 pounds in pulling the rig. Therefore $75 \times 440 = 33{,}000$ pounds or one horse power.

The horse power of an engine is equal to lifting 33,000 pounds one foot high in one minute.

In calculating the horse power of an engine the general rule is to multiply together the pressure in pounds on a square inch of the piston; the area of the piston in inches; the length of the stroke in feet; and the number of strokes per minute. The result divided by 33,000 gives the horse power.

In determining the horse power of boilers, the rule established by the American Society of Mechanical engineers, is to consider 30 pounds of water evaporated per hour from a temperature of 100 degrees F., under a pressure of 70 pounds by the gauge, as equivalent to one horse power.

SALARIES PAID IN THE UNITED STATES NAVY.

Admirals,	$13,500	per year
Rear-Admirals,	$4,675 to 7,500	per year
Captains,	2,975 to 3,500	per year
Commanders,	2,550 to 3,000	per year
Lieut.—Commanders,	2,125 to 2,500	per year
Lieutenants,	1,530 to 1,800	per year
Ensigns,	1,190 to 1,400	per year
Midshipmen,	500 to 950	per year
Warrant officers,	900 to 1,200	per year
Mates,	500 to 1,200	per year
Petty officers,	30 to 70	per month
Seamen,	9 to 35	per month

The vessels of the United States Navy are divided into four classes:

(a.) Vessels of the first-class carry forty guns, or more, and are commanded by commodores.

(b.) Vessels of the second-class carry less than forty, and more than twenty guns, and are commanded by captains.

(c.) Vessels of the third-class carry twenty guns, or nearly that number, and are commanded by commanders.

(d.) Vessels of the fourth-class are those of the smallest size, and are commanded by lieut.-commanders.

The admiral has command of all the navy of the nation, and may command a fleet in person. In active service, a commodore often has command of a squadron, or even of a fleet; a captain may command a first-class vessel, or even a squadron; and other officers may hold command above their rank, as is done sometimes in the army.

Definitions.

A FLEET—A collection of war-ships. A fleet is divided into divisions and squadrons.

A SQUADRON—A number of vessels of war detached from the main fleet. A squadron is smaller than a fleet and larger than a division.

FLOTILLA—A fleet comprised of small vessels.

THE FASTEST ATLANTIC OCEAN PASSAGES.

Steamer Lucania—
Queenstown to New York—5 days 7 hours, 23 minutes.

Steamer Lucania—
New York to Queenstown—5 days, 8 hours, 38 minutes.

Steamer Deutschland—
Cherbourg to New York—5 days, 11 hours, 54 minutes.

Steamer Kaiser Wilhelm Der Grosse—
Southampton to New York—5 days 20 hours.

Steamer Kaiser Wilhelm Der Grosse—
New York to Southampton—5 days, 17 hours, 8 minutes.

Steamer La Savoie—
Havre to New York—6 days, 10 hours.

Steamer La Lorraine—
New York to Havre—6 days, 9 hours, 47 minutes.

PROVISIONING AN ATLANTIC LINER.

The following figures from the steamer 'Kronprinz Wilhelm' show the enormous amount of provisions put aboard the big passenger steamer for a single one-way trip from New York to Bremen—7 days.

19,800 pounds fresh meats.
14,300 pounds salt beef.
2,640 pounds ham.
1,320 pounds bacon.
506 pounds sausage.
4,840 pounds poultry.
25,320 pounds vegetables.
25,000 eggs.
33,000 pounds flour.
1,980 pounds fresh fish.
330 pounds salt fish.
61,600 pounds potatoes.
425 tons fresh water.

6,600 pounds butter.
2,640 pounds dried fruit.
11,000 pounds fresh fruit.
1,716 gallons milk.
850 bottles Champagne.
980 bottles Claret.
135 bottles Madeira.
1,700 bottles Rhine wines.
760 bottles rum.
5,250 bottles mineral water.
600 bottles beer.
2,950 gallons beer in kegs.

From 'The Scientific American Reference Book.'

GROUP OF NEW YORK PILOTS OFF SANDY HOOK

A FEW OCEAN DISTANCES—STEAMER TRACK.

Quebec to—	
Liverpool,	2,600 miles
New York to—	
Liverpool,	3,053 miles
Queenstown (Ireland)	2,823 miles
Bordeau, (France)	3,187 miles
Gibraltar,	3,215 miles
Bermuda Islands,	690 miles
Havana, (Cuba)	1,227 miles
Porto Rico,	1,426 miles
Cape Town, (South Africa)	6,640 miles
Cape Horn,	7,000 miles
San Francisco to—	
Yokohama, (Japan)	4,791 miles
Sidney, (Australia)	6,579 miles
Honolula,	2,089 miles
Valparaiso, (South America)	5,140 miles
Phillipine Islands,	6,800 miles
Sitka, (Alaska)	1,302 miles

GREAT SALT LAKE.

While 100 pounds of ocean water contains 3½ pounds of salt, 100 pounds of water from the Great Salt Lake of Utah contains 22 pounds of salt. This lake is seventy miles long, thirty miles broad, with an average depth of eight feet. Its surface is 4,200 feet above the level of the sea. No living creatures are found in this water. There is no outlet to the Great Salt Lake but two fresh water rivers empty into it.

THE SUEZ CANAL.

Opened in 1869. First cost sixty million dollars. This canal is eighty-five miles long. Connects Mediterranean Sea with the Red sea. Shortens the route between Europe and India. Without this canal vessels would have to go around the Cape of Good Hope to get to India. From London, England, to Bombay, India, by the old route, the distance is 11,220 miles and through the canal the distance is 6,330 miles—shortening the distance nearly 5,000 miles. Port Said is at the Mediterranean entrance and Suez is at the Red Sea entrance. The level of the Red Sea and the Mediterranean is exactly the same but at the Red sea end there is a tide of 6½ feet while at the Port Said end the tide rises just 1½ feet.

WHERE ARE THE GREAT CANALS ?

Suez the Largest and Oldest, Languedoc the Longest, and the Soo the Busiest of Artificial Waterways.

When Tyre and Sidon, the greatest maritime cities of classic times, were hardly more than settlements, and a thousand years before the reputed fall of Troy, tradition has it that by 2,000 B. C. the ancient Egyptians had dug a navigable ditch from the Mediterranean to the Red Sea.

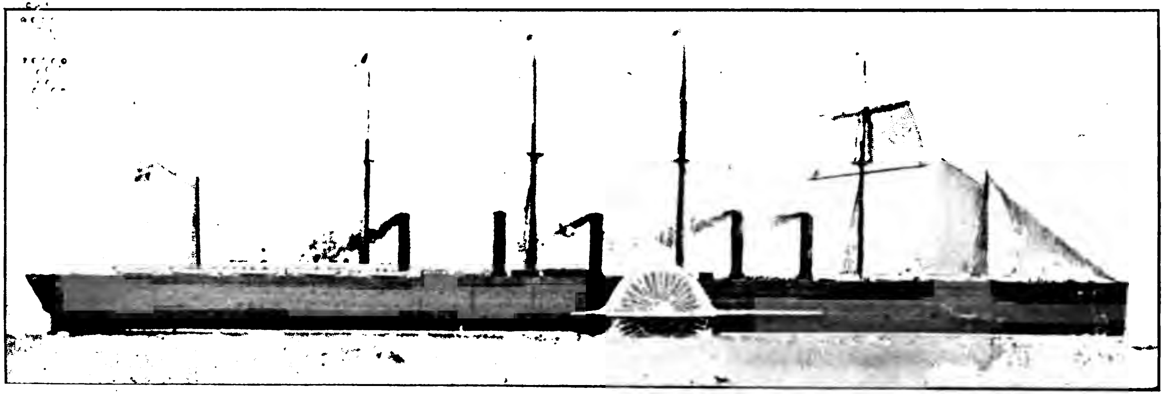
Thus, in all probability the Suez Canal—which holds, and will h until the completion of the great cut through the American isthr the palm as the greatest interoceanic waterway—is historically e grandfather of them all.

As it stands today, with its 85 miles of length, it is not quite sixty years old, having been begun in 1859, by the Frenchman de Lesseps, who finished the work in ten years. Its cost, in its present form, was slightly in excess of one hundred million dollars; the gross tonnage carried through in a year is in the neighborhood of fifteen million tons.

The French seem to have been always foremost in realizing the value of canals, for they were the first modern people to undertake on a large scale a system of artificial waterways, though most that they made had no deep-sea connections. Under Louis XIV, however, in 1681, the famous Languedoc cut was completed. This connects t Bay of Biscay with the Mediterranean, and though it has the rather markable length of one hundred and sixty-eight miles, it is not a sh canal, being too shallow to float anything larger than hundred-ton barges.

Of modern channels connecting bodies of salt water, that betwe the Gulf of Cornith and the Gulf of Aegina is invaluable to the cities southern Europe. By its four miles of cut, largely through picturesq ly bleak walls of granite, it reduces the distance from Adriatic por to the Black Sea about one hundred and seventy-five miles, and fro Mediterranean ports, about one hundred miles. Like the Suez Canal it is without locks, being on the sea-level, with a depth of twenty-si feet. It was completed in 1893, at a cost of about five million dollar According to tradition, the plans for this canal go back to Alexande the Great, who first conceived the idea. Julius Caesar projected t cut, and Nero actually began it, but soon lost interest.

Two waterways have been constructed from the north to the Baltic Sea, the Elbe and Trave Canal and the Kaiser Wilhelm Canal, the last



THE GREAT EASTERN

of which is of great commercial importance, though it was built mainly for military and naval purposes. It was finished in 1895, being in length sixty-one miles, and terminating in the Baltic Sea at Kiel.

The five remaining ship canals, though they do not run from sea to sea, have played extraordinary parts in revolutionizing maritime traffic. The oldest is the Cronstadt and Petersburg Canal, completed in 1890, and running from the Gulf of Finland to the Russian capital, about sixteen miles. Another is the Manchester Ship Canal, which makes Manchester, England, practically a sea-port by opening a water-route to the Mersey River, Liverpool, and thence to the Atlantic.

The three other great canals are on this continent, and are the Welland Cánal, between Lake Erie and Lake Ontario, and the Canadian and American cuts at Sault Ste. Marie, between Lake Superior and Lake Huron, making possible an unbroken passage from Duluth to the sea. The Soo canals are the busiest in the world in point of gross tonnage, and have also the largest lock in the world.

Recently the long-talked-of Cape Cod Canal has been revived, and it is said that the contract for its construction has been settled upon.

NOAH'S ARK.

According to the Bible the ark was 300 cubits long, 50 cubits wide, and 30 cubits high. This is equivalent to 525 feet long, 87½ feet wide, and 52½ feet high.

THE GREAT EASTERN.

Designed by the English Civil Engineer, Brunel. Built by Scott Russel at Midwall-on-the-Thames, for the Eastern Steam Navigation Co. Was 4½ years in building. Required 3 months to launch.

Length, 680 feet; beam, 82½ feet. Including the paddle boxes she was 118 feet beam. Draught 27 feet. Tonnage 20,000. Eleven engines aggregating 11,000 horse power. Both propeller and paddle wheels, ten anchors, six spars, five smoke stacks. She was a financial failure and in 1888 was sold and broken up for her iron.

THE FLYING DUTCHMAN.

The legend runs that in the year 1652 a Dutch ship, called the Braave, sailed from Batavia for Amsterdam. But a succession of westerly gales prevented her from getting around the Cape of Good Hope and drove her away to the eastward. Captain Vanderdecken, while in a passion over the delay, defied Heaven and shaking his clenched fist at the skies, swore that he would double the cape in spite of God himself. From that day the phantom ship has been struggling to weather the Cape of Good Hope. But the mark of blasphemy against God is on the vessel and she is doomed with her Dutch skipper and crew, to sail hopelessly on forever, sometimes reaching, but never passing, the meridian which calls for them to halt. Sailors believe that to sight this vessel will bring them gales, shipwreck, and death. In recent years no one has reported seeing the Flying Dutchman.

THE LATEST STORY OF THE "FLYING DUTCHMAN."

A Fantom Ship Exposed.

Science has struck down another treasured tradition of the sea. For many years it has been a popular belief that the Flying Dutchman had made of the stormy waters around Cape Horn as nearly permanent a home as that unfortunate's fate permitted him to enjoy.

Ship after ship reported seeing a three-masted vessel, very low in the water, drifting through the Straits of Le Maire, one of the less-frequented passages in the dangerous archipelago around Cape Horn. Unimaginative captains declared that the stranger was a derelict, with her decks awash and apparently water-logged.

Considering the ordinary condition of the weather in that desolate corner of the globe, there was no reason to be surprised at the existence of a derelict, but it was regarded as peculiar that her sails should always be set and that she should always be encountered in the narrow Straits of Le Maire.

Sailors, less skeptical than their skippers, called her either the Flying Dutchman or the ghost-ship of Le Maire. She was always encountered head on, pointing to the south, and carrying very short sail. On the whole, the fantom ship presented a gloomy picture with her black hull and weather-beaten sails.

For a long time no one troubled to investigate this ghostly apparition. The Straits of Le Maire are little used. Steamers usually pass through the Straits of Magellan, to the north, and sailing vessels prefer, by going to the south of Cape Horn itself, to keep well clear of the rocks and pitfalls in which the shorter routes abound. When the weather is exceptionally favorable, however, outward, or westward bound ships do occasionally run through. On the way back into the Atlantic the passage is never used.

For this reason, little attention was paid to the reports of the few ships that penetrated this alley of a detested labyrinth. But one or two of the stories could not easily be passed over. For instance, the officers on the Crown of Italy saw the fantom distinctly as a water-logged bark. They rashly attempted to approach it, and ran their own ship ashore on the rocks. When they next looked for the bark she had disappeared in the mists.

Then the Norwegian bark Servia came into Seattle to corroborate the tale of the officers of the Crown of Italy. With that the United States Hydrographic Office made public the explanation.

The persistence of the fantom had at last aroused the Argentine government to the necessity of investigating its haunted strait. A tender was sent out from the nearest lighthouse and the fantom run to earth.

It proved to be made of rock and shadow.

Among the jagged rocks that line both sides of the straits one was found which under certain conditions bore a striking resemblance to a ship. The shadows thrown by the other rocks completed the picture, and the whole presented the appearance of a bark running under short sail.

The likeness would be striking anywhere, but the almost perpetual fog in which the ocean around Cape Horn is enshrouded makes it appear still more extraordinary, and their very natural distaste for this playground of storms has long inclined seamen to believe anything to the disadvantage of the dreary region. Close at hand, the fantom ship, of course, resolves itself into a mass of rock.—From "The Ocean."

THE GREAT BATTLE OF LAKE ERIE.

During the war of 1812 between England and the United States, Commodore Perry was ordered to Erie—then called Presque Isle—to take charge of the construction of a fleet by which the Americans hoped to wrest from the British the control of Lake Erie. By the end of the summer of 1813 nine ships were built and manned and on the 10th of September the battle of Lake Erie was fought in Put-in-Bay. The American fleet consisted of three brigs, five schooners, and one sloop, and manned by 490 officers and men. The British had two ships of war, two brigs, one schooner and one sloop, and about 460 officers and men. Oliver Hazard Perry commanded the American fleet and Robert H. Barclay commanded the English fleet. The battle lasted three hours and fifteen minutes, the Americans winning. 123 Americans were killed and 135 British. The Americans captured the entire British fleet.

ROPE MAKING.

Manilla hemp is used in making the best grades of rope and the United States annually imports $6,000,000 worth from the Phillipine Islands. Sisal from Yucatan and Jute from the East Indies are used in making the cheaper grades of rope. The best brands of Manilla rope generally retail for about 14 cents a pound, the cheaper grades sell for about 12 cents.

Bales of Manilla hemp weigh about 270 pounds each. The bales are opened and the fibre is put through a combing process by machinery to straighten it out. It is then spun on spindles that are made to revolve at the rate of 1500 revolutions per minute. This spinning twists the fibre right handed into yarn, about 1,000 yards on each bobbin. The next process twists the yarn left handed into strands, and the third process twists the strands right handed into the finished rope. In the manufacture of large towing hawsers, part of the work is done by hand.

The size of Manilla, iron and steel ropes required to stand the same strain is given as follows:

Manilla rope,	12 inches circumference
Steel cable,	3¾ inches circumference
Iron cable,	4⅝ inches circumference

A Manilla towing hawser of the size in common use on the lakes—about 1,000 feet in length and 9 inches in circumference—costs about $300.00 each. A steel towing cable that will stand the same strain and of the same length, costs about $500.00.

THE CREW LIST OF A MODERN OCEAN PASSENGER STEAMER.

S. S. St. Louis, Voyage New York and Southampton.

SAILING DEPARTMENT.

Captain,	1
Chief Officer,	1
First Officer,	1
Second Officer,	1
Third Officer,	1
Fourth Officer,	1
Carpenters,	3
Boatswains,	2
Quartermasters,	12
Master-at-Arms,	4
A. Bs.,	20
Cadets,	6
Mail Clerks,	4
Marconi Operator,	1
	—
Total Sailing Department,	58

PASSENGER DEPARTMENT.

Purser,	1
Surgeon,	1
Chief Steward,	1
Second Steward,	1
Stewardess,	6
Ass't Stewards, 1st Cl. 33, 2nd Cl. 18, 3rd Cl. 19,	70
Cooks, 1st Cl. 6, 2d Cl. 4, 3rd Cl. 5.	15
Storekeepers, 1st Cl. 2, 2d Cl. 1, 3rd Cl. 1.	4
Bakers, 1st Cl. 2, 2d Cl. 1, 3rd Cl. 2,.	5
Butchers, 1st Cl. 1, 2d Cl. 1, 3rd Cl. 1.	3
Barbers,	2
Scullerymen,	2
Pantrymen,	6
Boys,	3
Printer,	1
Purser's Asst.,	1
Mess Room Stewards,	5
Total Passenger Dept.,	127

ENGINE DEPARTMENT.

Chief Engineer,	1
1st Ass't Engineer,	3
2nd Ass't Engineer,	6
3rd Ass't Engineer,	3
4th Ass't Engineer,	3
5th Ass't Engineer,	
Electric Engineer,	2
Refrigerator Engineer,	2
Deck,	1
Storekeepers,	2
Oilers,	21
Firemen,	66
Trimmers,	46
Cadets,	6
Total Engine Dep't.	162
Total Crew,	347

HELP IN CASE OF DROWNING.

Loosen clothing; empty lungs of water by laying body on stomach and lifting it by the middle so that head hangs down; jerk the body up and down a few times while in this position; pull tongue forward and fasten it out with a handkerchief; lay the body with face up and imitate the motion of respiration by alternately compressing and expanding the lower ribs, about twenty times a minute. This is best done by standing astride the body and placing the flat of the hand on each side of the sufferer. Don't give up.

Tests of Death—

Hold mirror to mouth. If living, moisture will gather.

Push pin into flesh. If dead the hole will remain. If living the hole will close up.

WEIGHT OF COMMON MANILLA ROPE OF THREE STRANDS.

Towlines.

100 fathoms 10 inch towline weighs 2,000 pounds.
100 fathoms 9 inch towline weighs 1,620 pounds.
100 fathoms 8 inch towline weighs 1,280 pounds.

Running Lines.

10 fathoms 6 inch line weighs 72 pounds.
10 fathoms 5 inch line weighs 53½ pounds.
10 fathoms 4½ inch line weighs 36 pounds.
10 fathoms 4 inch line weighs 32 pounds.
10 fathoms 3½ inch line weighs 24 pounds.
10 fathoms 3 inch line weighs 18 pounds.
10 fathoms 2½ inch line weighs 12 pounds.
10 fathoms 2 inch line weighs 8 pounds.

A HANDY RULE FOR GETTING NET TONS FROM GROSS TONS.

Multiply gross tons by 12; add product to gross tons, as follows:

Example.

The amount of your cargo is 2,000 gross tons.
2,000×12=24,000 24,000
Then add 2,000 as follows 2,000
2,240 net tons.

AN OLD-FASHIONED WAY OF FINDING THE LENGTH OF THE DAY OR NIGHT.

The day is double the time of sunset.

The night is double the hour of sunrise.

EXAMPLE 1.

Sun sets at 8 p. m. Length of the day was 16 hours.

EXAMPLE 2.

Sun rises at 5:30 a. m. Length of the night was 11 hours.

MARINER'S MEASURE.

Fathoms—6 feet.
Furlong—⅛ of a mile.
Cable length—100 fathoms.
Nautical mile—6,082 feet.
Statute mile—5,280 feet.

League—A measure of distance varying in different countries. In United States, England, France and Italy, a league is 6,075 yards. Germany and Holland, 8,100 yards. Spain, 7,416 yards. Russia, 8,468 yards.

MEASURE YOUR COAL BUNKERS.

With ordinary soft coal there should be 45 cubic feet per ton.

Example.

Your coal bunker is 30 feet long, 10 feet wide, and 10 feet deep.

$$\frac{30\times10\times10}{45}=66\text{ tons.}$$

MEASURE YOUR TANKS.

36 cubic feet of fresh water weigh one ton; 35 cubic feet salt water weigh one ton.

Example.

Your tank is 12 feet long, 6 feet wide, and 7.6 feet deep.

$$\frac{12\times6\times7.6}{36}=14.6\text{ tons water in tank.}$$

TRY THIS.

An Old Sailor's Plan For Figuring the Contents of a Round Tank.

A tank is round and 5 feet high. He passes a rope yarn around it and finds the outside measurement is 12 feet. He figures this would make a square tank 3 feet by 3 feet. The problem then changes into an easy one of figuring the contents of a square tank, which would be as follows:

$$\frac{3\times3\times5}{36}=1\tfrac{1}{4}\text{ tons.}$$

One ton of fresh water contains 224 U. S. standard gallons. Therefore the above tank would hold 280 gallons.

One cubic foot of fresh water contains 7½ U. S. standard gallons.

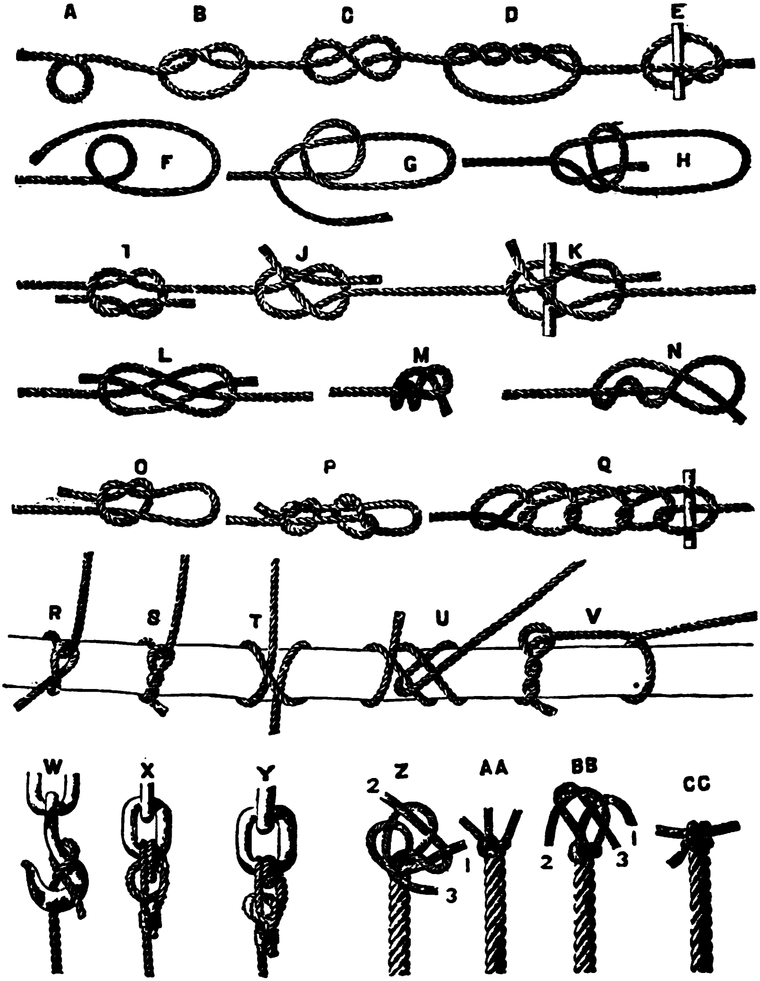


ILLUSTRATION OF KNOTS.

KNOTS OF ALL KINDS.

A. Bight of a rope.
B. Simple or overhand knot.
C. Figure 8 knot.
D. Double knot.
E. Boat knot.
F. Bowline, first step.
G. Bowline, second step.
H. Bowline completed.
I. Square or reef knot.
J. Sheet bend or weaver's knot.
K. Sheet bend with a toggle.
L. Carrick bend.
M. Stevedore knot completed.
N. Stevedore knot commenced.
O. Slip knot.
P. Flemish loop.
Q. Chain knot with toggle.
R. Half-hitch.
S. Timber-hitch.
T. Clove-hitch.
U. Rolling-hitch.
V. Timber-hitch and half-hitch.
W. Blackwall-hitch.
X. Fisherman's bend.
Y. Round turn and half-hitch.
Z. Wall knot commenced.
AA. Wall knot completed.
BB. Wall knot crown commenced.
CC. Wall knot crown completed.

The principle of a knot is that no two parts, which would move in the same direction if the rope were to slip, should lay along side of and touching each other.

The bowline is one of the most useful knots; it will not slip, and after being strained is easily untied. It should be tied with facility by everyone who handles rope. Commence by making a bight in the rope, then put the end through the bight and under the standing part as shown in G, then pass the end again through the bight, and haul tight.

The square or reef knot must not be mistaken for the "granny" knot that slips under a strain. Knots, H, K and M are easily untied after being under strain. The knot M is useful when the rope passes through an eye and is held by the knot, as it will not slip and is easily untied after being strained.

The timber-hitch S, looks as though it would give way, but it will not; the greater the strain the tighter it will hold. The wall knot looks complicated, but it is easily made by proceeding as follows: Form a bight with strand 1 and pass the strand 2 around the end of it, and the strand 3 round the end of 2 and then through the bight of 1 as shown in the engraving Z. Haul the ends taut when the appearance is as shown in the engraving AA. The end of the strand 1 is now laid over the center of the knot, strand 2 laid over 1, and 3 over 2, when the end of 3 is passed through the bight of 1 as shown in the engraving BB. Haul all the strands taut as shown in the engraving CC.

ELECTRICAL UNITS.

Volt—The unit of electrical motive force. Force required to send one ampere of current through one ohm of resistance.

Ohm—Unit of resistance. The resistance offered to the passage of one ampere, when impelled by one volt.

Ampere—Unit of current. The current which one volt can send through a resistance of one ohm.

Coulomb—Unit of quantity. Quantity of current which, impelled by one volt, would pass through one ohm in one second.

Farad—Unit of capacity. A conductor or condenser which will hold one coulomb under the pressure of one volt.

Joule—Unit of work. The work done by one watt in one second.

Watt—The unit of electrical energy, and is the product of ampere and volt. That is, one ampere of current flowing under a pressure of one volt gives one watt of energy.

One electrical horsepower is equal to 746 watts.

One Kilowatt is equal to 1,000 watts.

To find the watts consumed in a given electrical circuit, such as a lamp, multiply the volts by the amperes.

To find the volts, divide the watts by the amperes.

To find the amperes, divide the watts by the volts.

To find the electrical horsepower required by a lamp, divide the watts of the lamp by 746.

To find the number of lamps that can be supplied by one electrical horsepower of energy, divide 746 by the watts of the lamp.

To find the electrical horsepower necessary, multiply the watts per lamp by the number of lamps, and divide by 746.

To find the mechanical horsepower necessary to generate the required electrical horsepower, divide the latter by the efficiency of the generator.

To find the amperes of a given circuit, of which the volts and ohms resistance are known, divide the volts by the ohms.

To find the volts, when the amperes and watts are known, multiply the amperes by the ohms.

To find the resistance in ohms, when the volts and amperes are known, divide the volts by the amperes.

WEIGHTS OF DIFFERENT WOODS IN BOARD MEASURE.

Estimate on 1,000 feet of dry lumber.

	lbs.		lbs.
White Oak	3,863	White Pine	2,100
Red Oak	3,396	Yellow Pine, short leaf	2,826
Black Walnut	3,176	Yellow Pine, long leaf	3,800
White Walnut	2,121	Cypress	2,300
Cherry	3,023	Redwood	2,185
Ash	3,400	Gum	3,070
Black Birch	3,131	Dry Lath	502
Beech	3,741	Cedar Shingles	203
Yellow Poplar	2,197	Pine Shingles	248
Maple	2,782	Norway 6 inch fencing	2,900
Hickory	4,349	White Pine fencing	2,500
White Ash	3,000	White Pine ⅝ ceiling	1,120
Whitewood	2,197	Piece Stuff, pine	2,560
Basswood	2,350	Norway Pine, ⅞ floor	2,375
Rock Elm	3,613	White Pine, ⅞ floor	1,900
Norway Pine	2,521		

DIMENSIONS OF THE EARTH.

Diameter at the Equator	7,926 miles
Circumference at the Equator	24,889 miles

Areas.

Land surface	52,158,000 square miles
Water surface	147,000,000 square miles

Oceans.

Pacific	71,000,000 square miles
Atlantic	35,000,000 square miles
Indian	28,000,000 square miles
Antarctic	8,500,000 square miles
Arctic	4,500,000 square miles

MISCELLANEOUS EQUIVALENTS.

231 cu. in. = 1 gal. liquid measure
268 4-5 cu. in. = 1 gal. dry measure
277.274 cu. in. = 1 imperial gal. of Great Britain
2150.42 cu. in. = 1 bushel of U. S.
2216.192 cu. in. = 1 bushel of Great Britain
2747.7 cu. in. = 1 heaped bushel
1000 oz. or 62½ lb = 1 cu. ft. of pure water
8⅓ lb. pure water = 1 gallon
5760 grains = 1 lb. Troy or apothecaries'
7000 grains = 1 lb. avoirdupois
24.75 cu. ft. = 1 perch of masonry
36 to 45 cu. ft. = 1 ton anthracite coal

WEIGHT OF A BUSHEL.

Barley	48 lb.	Corn in ear	68 lb.	Peas	60 lb.
Beans	60 lb.	Clover seed	60 lb.	Potatoes	60 lb.
Buckwheat	42 lb.	Flax seed	56 lb.	Rye	56 lb.
Bran	20 lb.	Hemp seed	44 lb.	Salt	56 lb.
Corn	56 lb.	Oats	32 lb.	Timothy seed	45 lb.
Corn meal	50 lb.	Onions	60 lb.	Wheat	60 lb.

THE FOLLOWING ARE IN COMMON USE.

100 lb. of grain or flour = 1 cental
100 lb. of dry fish = 1 quintal
100 lb. of nails = 1 keg
196 lb. of flour = 1 barrel
200 lb. of beef or pork = 1 barrel
240 lb. of lime = 1 cask
280 lb. of salt at N. Y. Salt Wks. = 1 barrel

LINEAR MEASURE.

12 inches = 1 foot .... ft.
3 feet = 1 yard .... yd.
5½ yards (16½ feet) = 1 rod .... rd.
320 rods = 1 mile .... mi.

SURVEYORS' LINEAR MEASURE.

Surveyors' Linear Measure is used by surveyors in measuring distances.

7.92 inches = 1 link .... l.
25 links = 1 rod .... rd.
100 links or 4 rds = 1 chain .... ch.
80 chains = 1 mile .... mi.

Note—The chain used by surveyors is called Gunter's chain and consists of 100 links. Its length is 792 inches, equal to 66 feet, or 4 rods. Its divisions are decimal, so that chains and links may be written as one number in the same manner as dollars and cents.

Thus, since 35 links equal .35 of a chain, 25 chains 35 links is written 25.35 chains.

TIME MEASURE.

60 seconds (sec.) = 1 minute .... min.
60 minutes = 1 hour .... hr.
24 hours = 1 day .... da.
7 days = 1 week .... wk.
365 days, or 12 calendar months = 1 common year .... yr.
366 days = 1 leap year
100 years = 1 century

CUBIC MEASURE.

1728 cubic inches (cu. in) = 1 cubic foot .... cu. ft.
27 cubic feet = 1 cubic yard .... cu. yd.
16 cubic feet = 1 cord foot .... cd. ft.
128 cubic feet = 1 cord .... cd.

SQUARE MEASURE.

144 square inches (sq. in.) = 1 square foot .... sq. ft.
9 square feet = 1 square rod .... sq. yd.
30¼ square yards = 1 square rod .... sq. rd.
160 square rods = 1 acre .... A.
640 acres = 1 square mile .... sq. mi.

SURVEYORS' SQUARE MEASURE.

Surveyors' Square Measure is used by surveyors in computing the area of land.

625 square links (sq. l.) = 1 square rod .... sq. rd.
16 square rods = 1 square chain .... sq. ch.
10 square chains = 1 acre .... A.

METRIC SQUARE MEASURE.

100 sq. millimeters (sq. mm.) = 1 sq. centimeter .... sq. cm.
100 sq. centimeters = 1 sq. decimeter .... sq. dm.
100 sq. decimeters = 1 sq. meter .... sq. m.
100 sq. meters = 1 sq. deckameter .... sp. Dm.
100 sq. deckameters = 1 sq. hektometer ...... sq. Hm.
100 sq. hektometers = 1 sq. kilometer .... sq. Km.

Note—The principal unit is the square meter, equal to 1,196 square yards.

METRIC LAND MEASURE.

100 centares (ca.) = 1 are .... a.
100 ares = 1 hectare .... Ha.

Note—The are, equal to a square dekameter, or 100 square meters, is 119.6 square yards, very nearly. The hektare is equal to 2,471 acres.

THE WORKING TOOLS OF A LAKE PILOT.

A Pelorus
A Bearing Finder
A Patent Log
A Hand Lead
A Deep-Sea Lead
A Good Compass
A Barometer
A Thermometer
Magnets
Chart Tools, etc.

Some Good Recipes

THE WHITEWASH USED BY THE UNITED STATES LIGHTHOUSE SERVICE.

This whitewash is used on lighthouses and on lighthouse property and can be used on wood, brick or stone, and is said to be nearly as durable as oil paint. Slack one-half bushel of lime with boiling water, keeping it covered during the process. Strain it and add a peck of salt dissolved in warm water; three pounds of ground rice put in boiling water and boiled to a thin paste; one-half pound of Spanish glue dissolved in warm water. Mix these well together and let the mixture stand for several days. When wanted for use, put a quantity on a portable furnace and apply it as hot as possible, using whitewash or painter's brushes.

HEATING TAR FOR WOODEN DECKS.

An excellent method of heating tar without danger of fire is to use a steam flue blower. Pure thick tar will spread better when heated by this method than if heated over a fire. And to those who prefer to thin the tar, before heating, with linseed oil, kerosene, or turpentine, this method can be recommended as being the only really safe one.

REMOVING PAINT.

Make a solution of equal parts of soda and quicklime. The soda should be dissolved in water first and the lime then added. Enough of each should be put in the water to make it about the consistency of paint. Apply this solution with a paint brush. A few moments are sufficient to remove the oldest paint, which may be washed off with warm water. Before repainting, the wood should be washed with vinegar or any acid solution to remove traces of alkali.

FINALE.

The successful pilot is the one that keeps posted. Every Government Bullentin, every Hydrographic report and the Marine column of the daily paper should be carefully scanned for newly reported obstructions, changes of buoyage, changes of lights, derelicts, etc. Vigilance is needed at all times.

Be wakeful, be vigilant,
Danger may be,
At an hour when all seemeth
Securest to thee.
—Southey.

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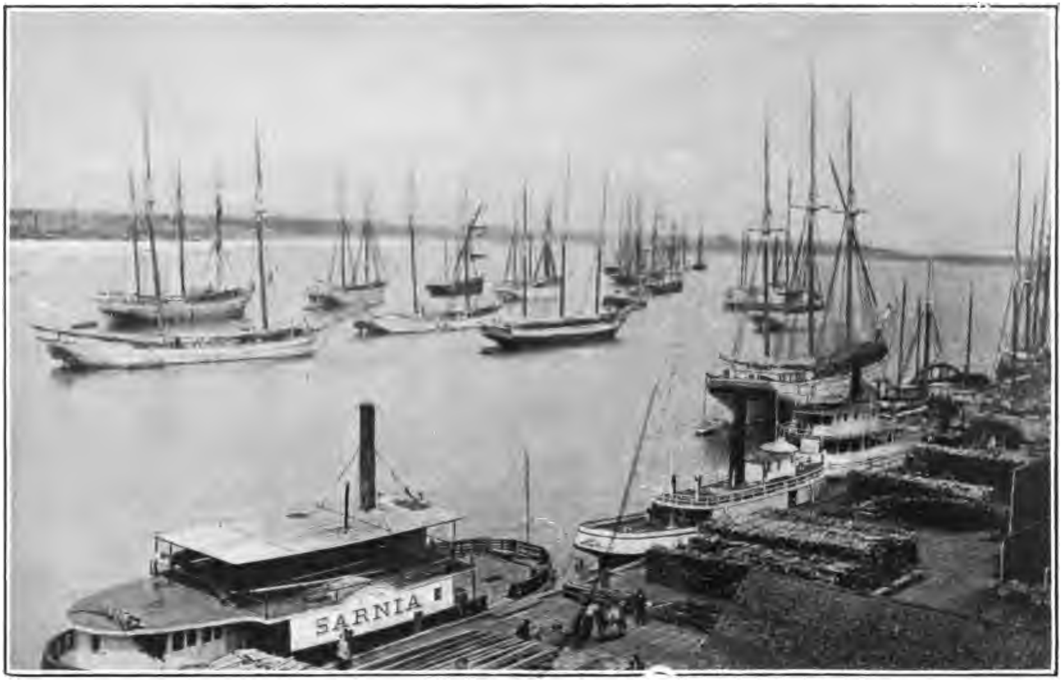

A STORM-BOUND FLEET IN SARNIA BAY FIFTY YEARS AGO